

MIGRATION - EUROPE'S INTEGRATION  
AND  
THE LABOUR FORCE BRAIN-DRAIN

NATIONAL REPORT - BULGARIA

CONTRACTOR:  
CENTER FOR THE STUDY OF DEMOCRACY  
Contract No. CIPE-CT93-6160

SOFIA  
1996

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## INTRODUCTION

What was going on in the science of Bulgaria in the years of transition and the related to it mass emigration of scientists abroad? Was that an occurrence of 'freedom euphoria', or 'a natural process of science internationalization'? What are the results from that process? What are the 'losses' and the 'benefits'? Who was the one 'to lose' and who - 'to win'? What are the perspectives?

All these become the concern of scientists and their researchers in the course of the last 5 years of transition. Migration processes complicated in themselves, turn still more so having in mind that we are considering a specific social community being ruled by both the general laws of migration and by its own principles and motives as well. Intellectual migration, although conceivable as personal decision and resulting from exercising basic human rights, can at the same time be very seriously damaging to the intellectual potential at the national level as depriving nation of the expert skills of highly-qualified specialists.

Reforms under way the accompanying social and economic problems are so many that the restructuring of science, the estimating of results from this restructuring, are not considered as important as they should be. Short-term problem solving turn out the priority of the last governments of transition, and little or no attention is paid to the long-term strategies in the economy, science or social development.

One of the major stimulating reasons for brain-drain from CEE was considered the socio-economic conditions of transition on the one hand, and on the other - the restoration of civil rights, free movement of citizens included.

The research carried out in Bulgaria was under the international project MIGRATION - EUROPE'S INTEGRATION AND THE LABOUR FORCE BRAIN-DRAIN, which involved 10 countries and 14 institutes. No doubt the Bulgarian survey managed to collect and generalize the largest amounts of information as against those in the other countries. The following research was carried out:

1. A full survey was undertaken of all emigration studies from 1989 onwards as well as of those dealing with the problem of science and its restructuring. Thus science migration was studied in Bulgaria not only in the framework of overall migration processes, but also in the context of the deep cataclysms experienced by Bulgarian science itself.
2. The real emigration was surveyed of scientists from 10 countries (5456 cases in the Bulgarian survey).

3. 107 directors and rectors of scientific institutions were interviewed to give their opinions on the real scientist migration. |

4. Statistical data were analyzed in depth evidencing the demography, economy, science and migration developments in the country.

5. Unemployed scientists were interviewed.

6. Discussion was carried out - a focus-group of students, who were asked about their emigration attitudes.

7. Representative sociological survey was carried - 983 scientists were interviewed in 53 institutes.

All this made it possible to trace the process in its depth and variety of occurrence, as well as to feature what was specific to Bulgaria and delineate the basic problems to be considered by the decision-makers in science so that the existing and the predictable future problems arising from scientist migration be surmounted.

The research carried out has as its major results the following:

- for the first time general conclusions have been drawn from all the research and wide range data collected - economical, statistical, sociological. The 1995 study results have been compared with the previous ones and lasting tendencies have been distinguished in the migration movement of scientists, in their standard of living and in the overall condition of Bulgarian science.
- Bulgaria has been compared for the first time with the other countries and the major result is the problems of scientist migration standing out as more severe in Bulgaria as against in other countries / like the critical financing of science, the considerable mass migration and internal fluidity from the most advanced branches of Bulgarian science, the disappointing position of Bulgarian scientists and the lower salaries paid to them as against scientists in other countries, the high potential migration, etc./
- Generalizations have been drawn on scientific exchange, which has been the substitute of the brain-drain process and Bulgaria's place in this process has been sought for, which seems quite on the unfavorable side.
- The research under way, it became the starting point of public discussions on the problems of science and scientists' mobility, of the strategies to ensure the successful development of Bulgarian science.

Conceptually the research contributed to the clarification and operationalization of the brain-drain concept as the process of spontaneous or purposeful stimulation of scientist migration. As UNO definition goes emigration accounts for 'any residing of a local person in

another non-resident country for a period longer than one year'. Not all emigration is 'brain-drain'<sup>1</sup>, but only in the cases when emigration is connected with the continuation of the scientific activities and research. A considerable proportion of scientists have left the country facilitated by the liberal passport administration in the hope of finding a good job not necessarily within the scientific system. This kind of movement in most cases can be characterized as waste of scientific potential, or 'brain-waste'.

It has been assumed that the people professionally engaged in scientific activities constitute the main substance of the 'brain' flow. In practical terms the category of 'scientists' included persons with higher education, employed in scientific institutions /all sorts of scientific institutions: higher educational establishments, institutes at the academy of sciences, state financed institutes, company financed institutes, non-profit making institutions/.

The active science restructuring together with the accelerating internal and external migration flows brought to the new categorization of these flows. New concepts were introduced in this connection and assumptions were verified as regards internal movement of scientists in two main areas - 'internal brain-drain' /the lasting abandoning of science for the purpose of doing private business or performing activities in any other areas where scientific experience is being used or activities carried on/ and the 'internal brain-waste', with these processes matched against the internal scientist migration processes.

The international scientist exchange, or 'brain-exchange' has been studied separately, and is considered to include the variety of forms of short-term external migration /less than 1 year stay abroad/, work on joint scientific projects, part-time employment abroad, degree-taking abroad, etc.

Authors of present study wish to express their special thanks to Barbara Rhode /European Union Committee/ for her contributions in conceptual and methodological respects, as well as for her overall assistance in this project's coming to reality.

# CHAPTER 1

## BACKGROUND

Among the Central and Eastern European countries Bulgaria comes about average in terms of number of population - 8,459,000 in 1991 and area of 110,911 sq.km.

### 1.1. Demographic Framework

Data shows great divergence of countries' performances in the situation of transition.

Natural growth is uniformly very low in all countries of Central and Eastern Europe and has been dropping so in the last ten years. Negative is the natural growth in Latvia (-4.9), Estonia (-4.0), Hungary (-3.2), Bulgaria (-2.9), Romania (-.6). The decreasing natural growth as common to all former socialist countries has been additionally sped up during transition. Bulgaria is among the countries with greatest drop in natural growth.

### NATURAL GROWTH (Live Births and Deaths Ratio)

Country	Natural Growth	
	1985	1993
<b>Bulgaria</b>	• 1.3.	-2.9
Czech Republic	0.4	0.3
Slovakia <sup>(1)</sup>		
Slovenia	3.1	-0.1
Hungary		-3.2
Poland	1.8	1.2
Latvia	2.2	-4.9
Lithuania		0.17
Estonia:	2.8-	- 4.0
Romania	4.9	-0.6

(1) Natural growth: 5.6 % (1980-91)

Major reasons for shrinking natural growth prove the low birthrates and the ageing of population. Life expectancy in Bulgaria is 72.3 years which is about the average for the countries in transition.

## LIFE EXPECTANCY AT BIRTH (1993)

Country	Life Expectancy at Birth		
	Male	Female	Total
<b>Bulgaria</b>			<b>71.2</b>
Czech Republic	68.5 <sup>(1)</sup>	76.1 <sup>(L)</sup>	72.3
•• Slovakia	68,4	76.7	72.5
Slovenia	69.4	77.3	73.3
Hungary	64.5	73.8	69.2
Latvia	61.6	73.8	67.2
Lithuania	63.3	75.0	69.1
Estonia	65.7	75.0	70.4
Romania	66.6	73.2	69,8 <sup>(1)</sup>

(1) 1992; (2) 1986-1991 (average for these years)

Life expectancy is about 70 years for all the countries. It is most fortunate in Slovenia - 73.3 years and least so in Lithuania - 69.1 and Hungary - 69.2. In the years 1985 to 1993 average life expectancy has gone up in most countries of Central and Eastern Europe, which is most recognizable in Slovenia, the Czech Republic, Slovakia. Average life expectancy has gone down only in Latvia and Lithuania. Bulgaria has sustained the same life expectancy as before. So reforms cannot be considered to have adverse effects on life expectancy.

Bulgaria as most of the Central and Eastern European countries with Estonia as exception has prevalingly female population which is 50.9% of all population, slightly rising in the period 1988 - 1993. Latvia - 53.6% and Lithuania - 52.7% have most numerous female populations.

## POPULATION BY SEX

Country	Sex			
	Male		Female	
	1985	1993	1985	1993
<b>Bulgaria</b>	<b>49.5</b>	<b>49.1</b>	50.5	<b>50.9</b>
Czech Republic	48.5	48.6	51.5	51.4
Slovakia	48.0	48.8 <sup>(1)</sup>	51.1	51.19 <sup>a)</sup>
Slovenia	48.6	48.5	51.4	51.5
Hungary	48.4*	47.9	51.6*	52.1
Poland	48.8	48.7	51.2	51.3
Latvia	46.2	46.4	53.8	53.6
Lithuania	47.1	47.3	52.9	52.7
Estonia	46.5	53.5	53.4	46.6
Romania	49.3	49.2 <sup>(1)</sup>	50.7	50.8 <sup>(1)</sup>

\* 1980

(1) 1992



Bulgarian population is heavily urbanized in character - 67.6% live in cities. Reforms only enhanced migration towards cities. After year 1985 the number of those living in cities has grown by 3.2%

### POPULATION IN TOWNS AND VILLAGES

Country	Population:			
	Towns		Villages	
	1985	1993	1985	1993
<b>Bulgaria</b>	<b>64.8</b>	<b>67.6</b>	35.2	<b>32.4</b>
Czech Republic		65.0		<b>35</b> <sup>(1)</sup>
Slovakia		55.6 <sup>(2)</sup>		44.4 <sup>(2)</sup>
Slovenia	48.9 <sup>(3)</sup>	50.5	51.1 <sup>(3)</sup>	49.5 <sup>(1)</sup>
Hungary	61.7 <sup>(4)</sup>	63.8	38.3 <sup>(4)</sup>	36.2
Poland	60.2	61.8	39.8	38.2
Latvia	68.5	68.7	31.5	31.3
Lithuania	65.1	68.2	34.9	31.8
Estonia	73.0	70.6	27.0	29.4
Romania	50.0	54.3 <sup>2)</sup>	50.0	45.7 <sup>(2)</sup>

(1) 1991; (2) 1992; (3) 1981; (4) 1980

The ageing of Bulgarian population is associated with increasing numbers of dependant population. The dependency ratio in Bulgaria is 1.27 - lowest among the Central and Eastern European countries.

Most favorable is it in Litva (2.83), Hungary (1.62) and the Czech Republic with 1.51, where the active population is much more numerous than the dependants. This is importantly indicative of the labour market picture and the social expense burdens lying on the budget. Countries with very high dependency ratio suffer harder budget implications and face more problems financing science development on the government budget, which holds particularly good for Bulgaria.

Bulgaria is among the countries with highest educated population. The shares of people with primary and below-secondary education decrease in the period 1985 - 1993, while those of people with secondary and higher education increase.

POPULATION WITH HIGHER EDUCATION  
(PER CENT FROM TOTAL POPULATION)

Bulgaria	<b>9.0(1993)</b>
Czech R.	7.2(1991)
Slovakia	7.8(1991)
Hungary	8.5 (1990)
Poland	9.0(1985)
Latvia	11.9(1989)
Lithania	11.4(1993)
Estonia	11.9(1989)
Romania	5.4(1992)

*Note: Slovenia excluded because of its different educational system*

The sweeping changes in the educational systems in all Central and Eastern European countries during the transition have not allowed the full statistic coverage of the system. Still the higher the education the better the implications for science. Most educated go Estonia, the Czech Republic and Poland with percentages of higher degree holders 11.9%, 7.2% and 9.0% respectively.

Students become more and more numerous in Bulgaria - despite of the decrease in youth population, in spite of the education getting more and more expensive, despite the students becoming less favorably treated in social terms, notwithstanding the high unemployment rates among higher degree holders. This trend evading logical explanations as it is, remains a factor extremely fortunate in the overall development of society, economy and science. 101,507 were the students in 1985, 151,510 in 1990 and 162,009 in year 1993. The number of students per 1,000 of the population is 20 or so per thousand in 1993, while in the countries of OECD it is about 25 per thousand (26 for Austria, 22 for Japan, 16 for Portugal, 12 for Turkey, 28 for Germany and France, 21 for England). As against the other Central and Eastern European countries Bulgaria boasts highest numbers per thousand - Estonia has 12 per thousand, Slovenia - 20 per thousand, Poland - 11 per thousand, the Czech Republic - 11 per thousand.

In recent years this has been so predominantly at the expense of the rising numbers of students paying all their educational expenses themselves. The trend is not uniform for all the countries in transition. While the number of students in Estonia grows smaller the opposite is true for Slovenia, Romania and others. Apart from the economical factors which are definitely there the above is explicable in terms of cultural traditions, educational system running, and a lot of other factors.

Demographic factors do not exercise direct influence on scientist migration. Most often they serve the general framework for the processes under way in science or the whole society. By and large the low natality rates, the negative natural growth are unfavorable factors for a country's development. Relatively significant remains the dependancy ratio factor which is extremely low and places budget with burdens thus limiting opportunities for science. The

constantly high Bulgarian aspiration for higher education which the critical conditions of transition to market economy did not impede, but rather nourished, is there to help form sizable scientific potential.

## 1.2. Restructuring of the Economy and Economic Growth

Bulgaria has made its choice and continues along the path of speedy and radical reforms despite the enormous difficulties - the painful social and political implications of the transition and unfavorable external economic conditions. Bulgaria sustained losses amounting up to approximately US \$1.2 billion from the Gulf war and about US \$ 1.4 billion due to the UN embargo against Serbia and Montenegro. Notwithstanding the numerous problems Bulgaria is effectuating the transition to a market economy peacefully and remains one of the few countries on the Balkans without ethnic tension and with effectively working democratic political institutions. Substantial progress has been made in moving towards a market economy, particularly so in respect of price policies, trade, foreign exchange regime liberalization and private businesses. The economic reforms started in year 1990 with the adoption of the package of new economic laws and the establishment of relevant institutional framework for their implementation.

### MAIN MACROECONOMIC INDICATORS

Indicators	Year				
	1992	1993	1994	1995	1996*
Inflation (CPI) %	79.42	63.86	121.94	32.9	29.0
GDP growth %	-7.3	-2.4	1.4	2.5	3.0
Industrial production	-15.9;	-10.9	8.5	4.6	8.0
Unemployed - registered eop	535,848	626,141	488,442	423,773	400,000
Unemployment - in %	15.3	16.4	12.8	11.1	10.5
Value added by the private sector - gross, as % of GDP	18	25.3	27.2	40	45
Exchange rate - BGL/USD eop	24.492	32.711,	66.015	70.704	85.4
Foreign exchange reserves - eop, in mln USD	902.2	655.3	1001.8	1254.4	1300.0
Trade balance - in mln USD	.484,5	-695.1	151.6	488.4	; 512.2;
Current account - in mln USD	451.6	-900.4	145.7	130.9	189.6
Wages in the public sector - annual average,:					
in leva	2047	3231	4822	6895	8963
in USD	83.6	116.9	88.9	102.7	114.0
Central Interest Rate (CIR covers Treasury's borrowing costs) - eop %	41	52	72	34	27
CIR - average %	45.1	44.8	63.9	50.1	31.0
Budget deficit %	6.3	11	6.4	<b>6.2</b>	5.3

Source: National Statistics Institute, BNB

\* Forecast

Bulgaria's economy has bottomed up the crisis it was in and is among the countries with moderate economic growth of 2.5% in 1995 as against the 1.4% in 1994 and the anticipated 3.5% for year 1996.

The GDP underwent substantial structural changes. The share of industry and agriculture is decreasing while that of services is expanding. Despite the ongoing restructuring, Bulgaria remains an industrial country. The share of manufacturing is 35.5% of the GDP, of services - 27%, of agriculture - 10%, transport and communications - 9%, of trade - 7%, etc.

The restructuring of economy has had the following implications for Bulgaria's science and scientific potential development:

- large-scale state owned enterprises being demonopolized in 1991 and the privatization in effect from 1992 on put under highly strained circumstances the large-scale scientific institutions, which used to belong under the state monopolies. As a rule the scientific units at the industrial enterprises were the first to suffer the mass labour force discharges and constituted the first unemployment waves. Worsely affected were those in the technical fields - engineers, process and planning engineers, biologists, etc. As a result applied science went into a deep crisis still not overcome. Data for the other countries in transition show most significant staff losses in applied sciences.
- The economic reforms go together with dramatic reductions of state expenditure and abandoning the practice of state subsidizing which harmed a lot both science and scientists who used to be fully budgeted. With the relatively low incomes earned and wages drawn the Bulgarians are only further pitched into emigration attitudes. Bulgaria is the country with lowest average monthly wage. This is to a certain degree attributable to the ineffective records of the wages in the private sector, which itself accounts for a 40% share yet of the GDP, as well as to the most active unregistered economy. Nevertheless the uniformly low pay, and especially so in science remains a factor permanently stimulating emigration.

#### GDP AND AVERAGE MONTHLY WAGE

Country	GDP*	GDP Growth (%)	Ave. monthly wage**
<b>Bulgaria</b>	<b>12.9</b>	2.5	<b>123.3</b>
Czech R.	35.8	4.8	380.7
Estonia	1.7	1.2	219.0
Hungary	39.2	2.0	346.3
Latvia	1.0	-2.0	169.8
Lithuania	4.1	3.1	166.7
Poland	96.0	6.5	294.0
Romania	26.6	6.9	146.2
Slovakia	12.4	6.5	279.2
Slovenia	13.3	4.8	606.4

\* 1995 in US\$bn

\*\* 1995 in US\$

Source: *Business Central Europe, April 1996, p.77.*

The economy under restructuring brought about the restructuring of science in view of certain industrial branches slumping and others fast gaining force.

Industry and agriculture reduce in their economy shares while services, including financial ones, are rapidly rising in share of GDP and employment. Electronics, machine building, metallurgy and other traditionally strong branches of the pre-transition Bulgarian economy are losing grounds and suffering deep crisis together with their highly developed theoretical and applied scientific institutions. For instance 5,633 internal-combustion engines only were manufactured in Bulgaria in 1994 as against 46,825 in 1989; the excavators were 22 in 1994 and 1,070 in 1989, the electric hoists - 6,242 and 138,247 respectively, the electric trucks - 3,439 and 47,438.

The big manufacturer giants once made up to serve the whole Comecon undergo restructuring or await closure and have little future relying on insecure foreign markets. Thus Bulgaria, as a country with a small domestic market and limited access to international markets, is becoming a country of small private businesses and self-employment. This kind of economic structure does not easily lend itself to developing large-scale science-consuming branches or to financing global research.

The downturn in the country's economic performance over the past five years is clearly now off and up again which sets preconditions for limiting migration as a whole and facilitating science development.

### *1.3. Labour Market*

Bulgarian labour market was established in 1989 with the work force let free of the obligation by the law to work and the administrative bodies in control of employment were founded there to make up for unemployment compensation. Although Bulgaria is said to be a country of slow reform as regards labour force it can be said to have seen "shock therapy" in the 5-year period of transition. This was period long enough for 65% of the labour force to leave the state sector, which now employs under 2 mln people.

The co-operative farms ceased to exist in the country, but the long taking restoration of claimed land property, "in real terms" - that is the restoration of the property of the land actually owned before it became part of the co-operative farms and not any land available - only contributed to the discharge of labour force including highly qualified experts in agriculture and scientific units related to agriculture. The gross agricultural product as produced by our agriculture slashed most dramatically in Bulgaria and Hungary.

## GROSS AGRICULTURAL PRODUCT

(Annual Change in Volume %)

Country	1990	1991	1992	1993
Romania	-0.5	0.8	-9.2	11.0
Hungary	-4.7	-17.4	-20.0	n.d.
Slovakia	-10.3	-8.5	-26.0	-6.7
Poland	-0.3	6.8	-12.3	0.0
<b>Bulgaria</b>	<b>-6.0</b>	<b>-0.3</b>	<b>-12.0</b>	<b>-13</b>

*Source: Committee for Agriculture, Trade Committee, Review of Agricultural Policies - Country Reports, 1993*

Famous though Bulgaria used to be for its robust agricultural science with the budget constraints and mass closures of scientific and applied units it became one of the major sources of mass internal and external migration of precious specialists and scientific workers. It all brought to the slow restructuring of agriculture, which used to be a leader in former Comecon and Europe.

Another major source of unemployment is the liquidation and restructuring of inefficient enterprises.

For all those reasons despite of the lowering labour force supply in view of the shrinking numbers of active population Bulgaria still remains among the countries with highest unemployment rates.

Unemployment is an important factor in the formation of emigration attitudes with the whole population and with the scientists alike; its reduction then would only promote the reduction of emigration.

## UNEMPLOYMENT RATES

Country	Unemployment Rates	
	1994	1995
<b>Bulgaria</b>	<b>12.8</b>	<b>11.1</b>
Czech R.	3.3	3.1
Estonia	1.8	2.0
Hungary	10.9	10.4
Latvia	6.0	6.6
Lithuania	5.2	7.9
Poland	16.0	14.9
Romania	10.6	8.7
Slovakia	14.8	13.1
Slovenia	14.2	14.4

While in the Baltic republics and Slovenia unemployment gets higher in Central European countries and Bulgaria in 1994 and 1995 it gets lower. As to Bulgaria though, it still remains one of the highest among the countries in transition.

Bulgaria is one of the countries with the largest share of unemployed with higher education - 17% of all unemployed.

UNEMPLOYED WITH HIGHER EDUCATION (1993)  
(Per cent of Total Unemployment)

<b>Bulgaria</b>	<b>17.0</b>
Czech R.	4.2
Slovakia	4.1
Slovenia	6.7
Hungary	2.7
Poland	52.1
Latvia	8.6
Lithuania	8.2
Romania	1.5

The educated unemployment share varies in the countries in transition. The variety is great. While in Romania only 1.5% of the unemployed have higher education this percentage in Poland is 52.1%. After year 1993 a trend has become obvious in Bulgaria of reducing the share of educated unemployment. This is a precondition favorable for weakening the emigration attitudes among the most educated part of the population and the scientists in particular.

Youth unemployment is another major problem of the Central and Eastern European countries becoming still more so in the light of the generation to generation continuity in science as will become clear later on - young people are unwilling to do research. Special measures are needed in this respect on the part of the government for encouraging young people, unemployed, too, into scientific vocation. Specific programmes can be introduced as early as into the educational curricula. Students and newly graduated alike can be involved in scientific projects. These would only pamper scientific employment later on.

#### *1.4. Science in Transition*

With no claim to have been comprehensive we will outline the most important trends only in the development of Bulgarian science and all the scientific community in the period of transition. The incomplete statistics would not allow more subtle and detailed analysis of the complicated processes of restructuring science.

We have to evaluate the internal as well as the international importance of the Bulgarian scientific thought, before we even start discussing the issue of brain draining, because after all the demand for scientists depends on their qualities and their contribution to the development of the world scientific thought. At the same time we have to bear in mind that in contrast to some other ex-socialist countries like Poland and Hungary, science and scientists in Bulgaria suffered much broader restrictions regarding traveling abroad, participation in international forums, etc. and there was restricted access to international magazines, etc. That is the reason why Bulgarian science and its development are less known abroad. In that sense, the start of the changes was the beginning of active participation of Bulgarian scientists in world level scientific researches by increasing the mobility of scientists as well as increasing their presentation in the international scientific society.

We can apply the following criteria originating in the modern tendencies in the field of evaluating scientific projects:

#### A. Existing "scientific schools"

The school presupposes the existing of at least a few generations of researchers, established scientific traditions and local scientific thought or subculture which result in a specified style of scientific activity. At present, in social researches of sciences it is commonly accepted that the exactly given subculture - an invaluable result of the work of generations of scientists - is the most important prerequisite for real high-scientific achievements and at the same time it is most easily vulnerable to social commotions.

In the above aspect we can distinguish the following scientific schools in Bulgaria:

*The Bulgarian Mathematical School* originates from the Czech-educated Ivan Salabashev and Anton Shourek, but the most extinguished representatives are the founder of the Geometry School Dimitar Tabakov, as well as the world-known scientist in ballistics Kiril Popov, the forefather of Bulgarian mechanics Ivan Tzenov and others. For the past several decades the Bulgarian Mathematical School has been developing in close relation with the Russian Mathematical School. Particular development is registered in the field of calculation mathematics, integrated with informatics and mathematical modeling. (Blagovest Sendov). *The Bulgarian Biology School*, founded by Metodii Popov, received remarkable development in the field of genetics by the world known scientist Doncho Kostov - the first director of the Institute for Applied Biology. At present the School has several branches - molecular biology (Rumen Tzanov), microbiology (Assen Hadjiolov), immunology of reproduction. (As the scientists emigration data below will show, these are the institutes which record the highest share of emigrated scientists who did not return).

<sup>1</sup> "Scientific school" means group of scientists who work in a narrowly specified field which is defined rather cognitive than institutionally (through commonly used theoretical schemes and research methods. The key characteristic of the "scientific school" is that the last is accredited by the scientific society in the respective field. Another main characteristic is to have a founder (or founders) of the school, whose scientific achievements and methodology play normative functions.



*The Bulgarian Physicist School* is developing primarily in the field of solid-state physics with founders Georgy Nadjakov and Rostislav Kaishev. Among the most distinguished representatives of this center is Milko Borissov. This Bulgarian School has received world wide recognition in the field of nuclear physics and energetics, electronics (Ivan Todorov). Physico-chemistry is a separate branch within physics which has its own School with remarkable development (I. Malinovski).

The *Bulgarian Geology School* is founded by Georgy Bonchev.

We can also distinguish *Bulgarian Organic and Inorganic Chemistry Schools*.

B. The so called " citation index" is also an indicator, however indirect, for the international recognition of scientists. In the Table below are given the scientific subfields where Bulgarian scientists have more articles (entries) in renown international publications.

INDICATORS OF CITATION OF BULGARIAN PUBLICATIONS

Discipline	Publications						
	Number	Relative Share	SMCR	MOCR	MECR	MESM	RCR
Physics-chemistry	<b>360</b>	0.30	<b>2.84</b>		2.4	<b>0.85</b>	0.91
Mathematics	31	0.15	0.73	0.46	0.60	0.82	0.76
Pharmacology	157	0.06	2.99	0.97	1.28	0.43	0.76
Electric-chemistry	133	0.56	2.48	1.55	2.07	0.83	0.75
Nortorganic and nuclear chemistry	117	0.18	2.63	<b>1.22</b>	1.69	0.64	0.72
Cytology and histology	95	0.07	4.49	1.90	2.81	0.63	0.68
Biophysics	<b>202</b>	<b>0.12</b>	5.04	<b>2.20</b>	<b>3.37</b>	0.67	<b>0.65</b>
Biochemistry and biology	510	<b>0.07</b>	6.22	<b>2.46</b>	4.02	0.65	<b>0.61</b>
Nuclear physics and technology	54	<b>0.14</b>	1.45	0.67	1.11	0.77	0.60
Organic chemistry	133	0.10	<b>2.59</b>	1.30	<b>2.19</b>	0.85	0.59
Chemistry	84	0.04	2.73	0.91	1.58	0.58	0.58
Crystallography	81	0.30	2.02	0.94	1.64	0.81	0.58

*Note: SMCR - Subfield Mean Citation Rate= average citation of papers from given subfield*

*MOCR - Mean Observed Citation Rate=real citation rate per paper in a preselected set of papers*

*MECR - Mean Expected Citation Rate*

*MESM - MECR/SMCR*

*RCR - Relative Citation Rate=MOCR/MECR*

As it could be registered from the data, the most important scientific fields according to this criteria are biophysics, mathematics, biochemistry, electrochemistry, spectroscopy, physics, solid-state physics and others. It could be expected that those are the fields with the highest brain drain flow.

There are other criteria and attempts for evaluation of the international realization of Bulgarian scientists, for example participation in international working groups, editorial offices of international magazines, lectures in foreign educational institutions and others.<sup>2</sup>. Further below, as in the analyses of the processes of scientific exchange, are suggested 6 international structures and criteria. In the present analyses we are trying to find the appropriate criteria only to define the "map of scientific fields where Bulgaria has certain achievements".

.....

The two criteria - scientific schools and level of citations totally overlap and outline the above mentioned "map". As the brain-drain research will show below the Bulgarian scientific schools are those that suffer the highest brain drain flow.

Bulgarian science endured turbulent changes in the past few years of transformation. The most important changes took place in 1992. A poll on the scientific activity shows that in the end of 1992 there were 657 organizations operating with scientific activity under their bylaws, 643 of which state-owned and 14 private and non-governmental. In that same year 255 of the state-owned institutes or 39.7% did not perform any research activity. 66 of them are closed down and 27% of the scientific institutes are reorganized.

The gross domestic product as produced by the scientific field of economy in Bulgaria is about the average for Central and Eastern Europe - 0.6%, while in Estonia it is 0.2%, in Slovenia - 0.7%, in Slovakia - 0.9%, in the Czech Republic - 0.8%.<sup>3</sup>

And as development of science cannot be divorced from the processes under way in the system of education the educational share within GDP has to be taken into account as well. Bulgaria and Romania report this to have been 4.2% in 1993, while in the Czech Republic it was 2.2%, in Slovakia - 3.1%, Slovenia - 3.4%, Estonia - 4.3%.

Employment in science dropped in absolute and relative terms in most countries in transition. Before the reforms Bulgaria used to have a highest standard by the indicator "employed in science per capita". And in 1990 in Bulgaria there used to be 11 employed per thousand as against the Czech Republic with 13 per thousand, Slovenia - 7 per thousand, Romania - 2 per thousand, Estonia - 9 per thousand, Poland - 3 per thousand.

That is Bulgaria dared to afford scientific employment as high as about 90,000 people, which was doubtfully efficient in all cases. Reduction of scientific staff should not along these lines be estimated as entirely negative.

<sup>2</sup> Raya Staikova, Professional Activity And International Recognition of Scientists, Sociological Review, vol. 4-5, 1993

<sup>3</sup> This conclusion is controversial due to existing methodological differences in the estimation of the GDP and the share of science within it.

## SHRINKING SCIENTIFIC EMPLOYMENT (1985 - 1993)

	(%)
<b>Bulgaria</b>	<b>54.6</b>
Czech R.	70.2
Slovenia	3.8
Poland	13.2
Latvia	35.5
Estonia	34.6

*Yearbook of Statistics. Sofia 1994.*

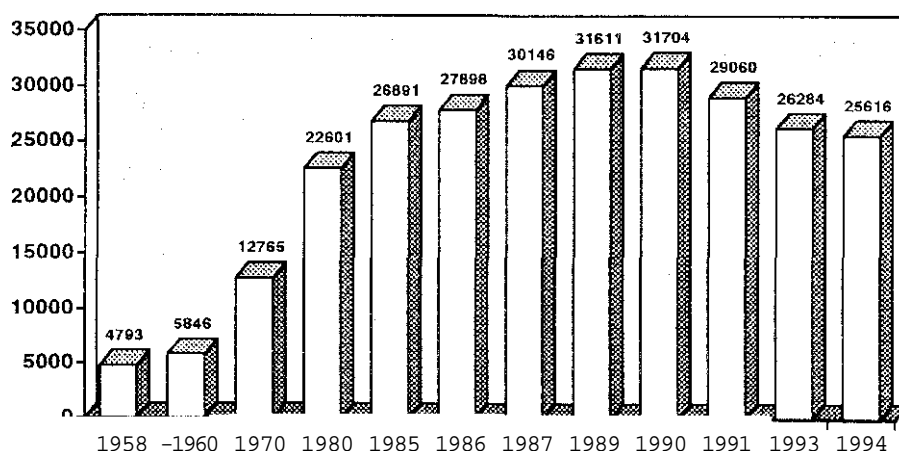
Romania is the only country with increasing employment in science, which seemed plausible owing to the low scientist share of its population. The Czech Republic took up fast and radical change policy and dispensed with 70% of its scientists. Slovenia's reforms provoked least loss of scientific employment.

Most significant real migration can be anticipated from the countries with most visible reductions of scientific staff. Bulgaria comes second after the Czech Republic in loss of scientific staff during the transition. In the long run by the end of 1993 the number of scientists had dropped abruptly down to a lowest 5 per thousand within Central and Eastern Europe.

The 31% reduction of scientific employment in Bulgaria is actually much higher than the 18.9% reduction of employment among scientific degree-holders. This is ascribable to the larger losses of staff employed in science supporting jobs, of young scientists with no degrees yet, and in much less extent of scientists proper, who have received recognition for their scientific activities and have been rewarded by respective degrees.

By all means when science is the topic numbers matter less than the qualitative indicators - like who were those who went off.

## SCIENTISTS IN BULGARIA 1958 - 1994



Before the offset of the reforms the number of scientists was stable in growing to reach the 31,704 peak of 1990. Conspicuously reverse was the tendency after that - the reduction in the number of scientists was 6,100 within four years which is an 18.9%.

Similar only a bit slower are the tendencies in the other countries of Central and Eastern Europe.

Within the degree-holding scientists the reduction in the last four years goes mostly on the account of the highest scientific degrees - academicians, associate members of the Academy of sciences.

### SCIENTISTS BY THEIR SCIENTIFIC DEGREE

	1980	1990	1991	1992	1993	1994
Academicians	.35	50:	47	47	42	8
Associate members of Academy of Sciences	33	50	42	36	37	31
Full professors	986 :	1:120	1187	1170	1147	1139
Senior researchers of the first degree (highest possible)	945	715	655	680	3650	570
Associate professors:	2008	2971	3,091	3186	3222*	3311
Senior researchers of the second degree (second highest)	2523	3666	3443	2994	•	2820
Lecturers	1103	1342	1236	2122	1125	1446
Assistant-professors	5796	7536	7985	7489	8949	9337

\* *Data referable to senior researcher of the first degree*

Data show that the restructuring of science affected mostly the scientific institutions outside education, quite reversely the number of lecturers and assistant professors belonging in the system of education is growing. Most countries in transition did the opposite - they saved their academies of sciences and their satellite institutes. Bulgaria is specific in this respect. The reasons for that are generally these:

- the transition took less cataclysms in the educational system - no educational institutions were closed and the existing ones, even in the political sciences were readjusted into new subjects and addressed new audiences.
- The liberalization of the administration of licensing new higher educational establishments led to the foundation of a whole lot of new universities and higher educational establishments which in turn contributed to the employment of faculty and recruitment of students.

The transition to paid tuition became a big source of income for the university budget. So discharge faculty universities did not - they rather hired more. Besides the more or less satisfactory pay, again guaranteed by the newly introduced tuition fees, prevents those employed in the higher educational system from internal and external migration.

Institutes at the BAS and other budgeted institutes were either closed or subsidized much less which resulted in mass discharges and the reduction of the absolute number and the share of researchers, senior researchers of the first and second degrees. This changed the structure of science. While in 1990 assistant-professors accounted for 23% of all scientists now they are about 37%; and the researchers from 45% of all scientists in 1993 turned out to be only 27%.

Hence higher educational institutions are being turned by circumstances into the place for development of science from the point of view of preserving and increasing their staff. This , should also be accompanied, although, by the proper overall restructuring of higher education and incorporating research activities within the teaching.

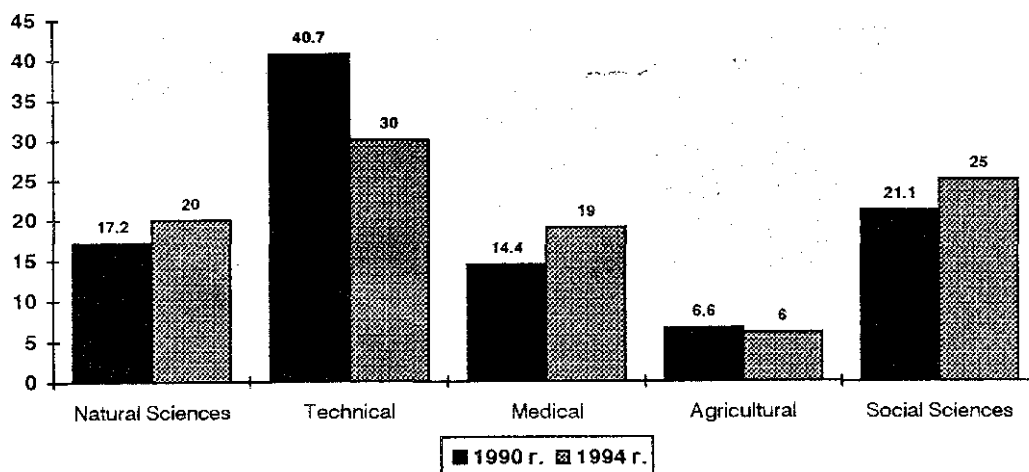
In quantitative terms the reductions have been greatest for the scientists in technical and agricultural fields. Social and natural sciences did reduce, but not too considerably their number of scientists. And the medical sciences saw higher employment. Most importantly the most significant reductions in all countries of transition have been not anywhere else but in the technical sciences. This is so for Slovenia - 15.8% reduction (as compared to the general scientific staff reduction of as little as 3.8%), Poland - with 24.1% reduction, Latvia with 86.6%, Estonia with 67.5%.

DYNAMICS OF NUMBER OF EMPLOYED  
BY SCIENTIFIC FIELD (1990 - 1994)

Total	-18.9
Natural	-5.6
Technical	-40.0
Medical	+5.0
Agricultural	-21.2
Social	-6.1

Although occurring within a short period of time these changes formed new structure of science.

### SCIENTISTS BY SCIENTIFIC FIELDS (Structure 1990 - 1994)



The prospects ahead of science and those involved in it depend mostly on the opportunities for financing.

Most countries show absolute and relative drop of science expenditure. In 1986 17.0% of the government budget went for science, while in 1993 it was only 6.6%; in Slovenia - from 6.5% to 3.2%, Romania - from 3.4% to 1.3%. In Bulgaria the slash was most dramatic - from 3.8% to .8%. Which makes Bulgaria and Latvia the two countries spending least on science. What must be added here is the almost total lack of reliable alternative sources of financing science - no funds, tax and other exemptions for the companies supporting science, underdevelopment of the sector yet not profitable itself on its own.

Bulgarian science is almost entirely dependent on the state budget as yet, and the scarce financing proves an important factor for the further deepening of the crisis and the generating of new waves of internal and external scientist migration.

Unlike the Czech Republic, Slovakia, Slovenia and Lithuania scientists' wage is lower in Bulgaria even than the average for the country (mind that with the incomplete data for the private sector the average for the country is much higher in reality).

### AVERAGE MONTHLY WAGE OF STAFF IN BULGARIA

	1990	1991	1992	1993
All industry	378	1012	2047	3145
Science	404	1031	2033	2911

Approximate calculations demonstrate that the monthly average wage of scientists in Bulgaria is among the lowest in Central and Eastern Europe.

MONTHLY AVERAGE WAGE OF SCIENTISTS  
BY COUNTRIES (IN \$ Us)\* **1993**

Bulgaria	92.5
Czech R.	259.1
Slovakia	186.2
Slovenia	498
Latvia	52.1
Lithuania	39
Estonia	77
Romania	62

\* Calculation based on the average dollar rate for the respective year

### 1.5. Emigration of Population

As everywhere in Central and Eastern Europe after the first emigration waves with the beginning of the reforms Bulgaria has seen decrease of emigration in recent years. Most substantial were the emigration movements in the years reforms started - 1989 in Bulgaria, 1990-1 in the Czech Republic, 1990 in Slovakia, 1987 in Poland, 1992 in Latvia, 1992 in Lithuania, 1992 in Estonia, 1990 in Romania.

NUMBER OF EMIGRANTS BY YEARS

	Country							
	Bulgaria	Czech R.	Slovakia	Poland	Latvia	Lithuania;-	Estonia	Romania
1985	-	1970	429	20 578	36 600	15 105		27249
1986	-	1871	554	29 008	24 300	15 859	12 349	26 509
1987	-	1664	673	36496	24 200	15 871	12 591	29 168
<b>1988</b>	-	1672	569	26 291	22 700	20 573	13 203	37 298
<b>1989</b>	218 000	2015	575	26 645	26 300	17637	12 326	41 368
1990	87 895	4113	867	18 440	25 400	23 592	12 402	96 929
<b>1991</b>	46 496	3896	527	20 977	23 800	20 703	13237	44 160
1992	69 348	468 <sup>(1)</sup>	128	18 115	51 800	28 855	37 375	31 152
1993	66 426	7424 <sup>(2)</sup>	7355 <sup>(3)</sup>		31300	15 990	16 169	-

(1) Since mid-1991 change in registration of emigrants (abolishment of emigration passports)

(2) Include emigration to Slovakia: Total - 7232, M - 3706, F - 3526

(3) Emigration to the Czech Republic after the split

Owing to considerable methodological differences in recording emigration from the different countries cross-country comparisons do not seem quite correct.

Despite the overall decrease of emigration emigrational attitudes are still high enhanced by the slugging reforms and the persistently dropping real incomes of most people.

Official statistics evidence mass emigration of people with higher education from Bulgaria in the first two years of the reforms, while their share in the overall outflow gradually diminishes. This is evidential from representative studies as well as from current statistics.

Education, as reported by a study of potential migration among those having passed through the border checkpoints leaving Bulgaria in 1991, does play a part in the process of making the decision for or against emigration.<sup>4</sup> As this study points out only 8% of those with higher education had previously made up their minds to permanently leave the country right at that journey, while with the less educated (8 years of basic school study) the share of those determined to do so was 33%.

At the same time however the intensity of potential migration among the people with higher education is higher for the so called "conditional migrants" - those setting certain conditions to leave the country.<sup>5</sup>

Unfortunately so far statistical data has not been collected and drawn general conclusions from in Bulgaria as to the emigration of scientists. These issues have not been specifically studied either. That is why the study under the international project - MIGRATION - EUROPE'S INTEGRATION AND THE LABOUR FORCE BRAIN-DRAIN was an opportunity unique in its attempt to grasp large-scale migration processes of Bulgarian scientists in the period of transition outlining aspects of the future at that as well.

<sup>4</sup> Y. Kalchev, S. Tsvetarsky "Potential Migration of Bulgarians Travelling Abroad", 1991, pp. 16 - 18.

<sup>5</sup> "Internal and External Migration of Population in the Late 90ies", NIS, 1992, p 29.



## CHAPTER 2

### REAL MIGRATION OF SCIENTISTS

#### *2.1. Aims, Goals of The Research, Representativity of Results*

This research aimed at estimating the real loss of scientists in the years after the reforms were started, at analyzing the structure of the outgoing flow of scientists thus answering the major question of: Has there been a brain-drain from Bulgaria since the reforms started and how important has been and is the issue raised. A goal set additionally is to estimate the size and the character of the internal staff losses correlating the processes of internal and external migration.

The sources of the data for the real migration of scientists have been:

- face-to-face interviews with 107 surveyed heads of a total of 107 scientific institutes - deans and rectors of universities and higher educational establishments 47 of which in the natural sciences, 36 - in technical sciences and 24 - in the social sciences.
- a retrospective study of all scientists assuming administrative positions ranging from "degree-holder specialist" (engineer researcher) up to full professors (senior researchers of highest scientific rank) who have left the scientific unit during the period between 01.01.1988 and 30.06.1995. The study has not taken into account the scientists withdrawing for natural reasons (retirement, death and the like). The year 1988 has been taken for starting point being the last forerunning the offset of the democratic reforms and the worsening economic situation in Bulgaria to serve a good basis for comparison as to the scale of the real migration in the years to follow.

The data collected are the result of the comprehensive study of all the organizations in Bulgaria registered as doing scientific and research activities at the Bulgarian Institute of Statistics, the higher educational establishments included here. A total of 205 such scientific organizations from around the country have been included as sampled typologically in the research of potential scientific migration in Bulgaria (61 units of this kind). For various reasons we have failed in collecting data from 16 scientific units which reduces the information return to 80%. Bearing in mind that as of 01.01.1995 the statistically recognizable state sector numbered 227 organizations falling under the definition of "science and supporting activities" hence it can be claimed that over 85% of all scientific organizations in existence during the research period have been covered.

The data has been collected with a separate questionnaire being filled up by the Personnel departments at the respective establishments for everybody gone off. In this way data has been obtained on a total of 6,005 having left the 205 scientific organizations included. This is a small figure if compared with the statistical data of slashing scientific employment which has two explanations - first is that the present analysis excludes those employed in supporting scientific activities, and second come the natural factors. Both these observations prompt that the mass losses of scientific personnel have mainly been ones of para-scientists and of socially least painful retiring people.

## 2.2. General Characteristics of the Scientist Outflow from the Organizations Studied

The sample under investigation is representative of some typical characteristics of the scientific community in Bulgaria - 5,456 of those gone off, that is, 90.9% are from Sofia - the rest are from the country. As known from the official records at the National Institute of Statistics, as of year 1995 72.6% of the scientists in Bulgaria are from Sofia. The most natural conclusion to be drawn is that the "brain-drain" has been more active in the capital as against the country.

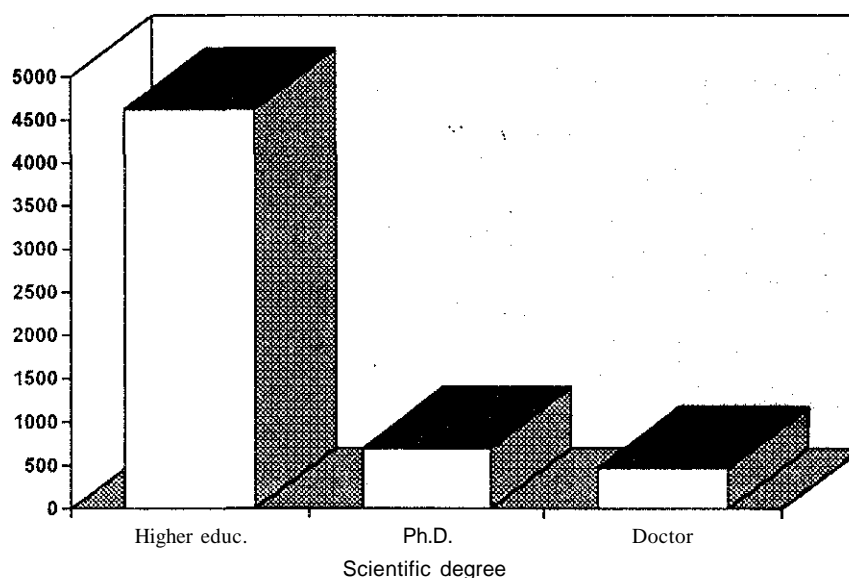
The distributions by sex prove that 53.3% of those left are men and 46.4% - women. The generally similar male-female ratios in science come in to prove that there are no specific distinctions by this feature.

The age structure of the community shows that the highest is the percentage of those belonging in the 35 to 49 age range - a total of 45.4% of the whole sample; while those aged 50 and over are 19.9%. The young scientists of age under 34 who have left their institute or laboratory number 1,013, that is 16.8%. The middle age group has been most significantly affected by the adverse economic and social conditions.

Only too similar is the distribution by years of graduation - the best part of those left have completed their higher education after year 1970 - 4,540 people comprising 75.6% of those sampled. Reversely so those who have graduated before year 1960 are as few as 182, that is 3% of the whole lot.

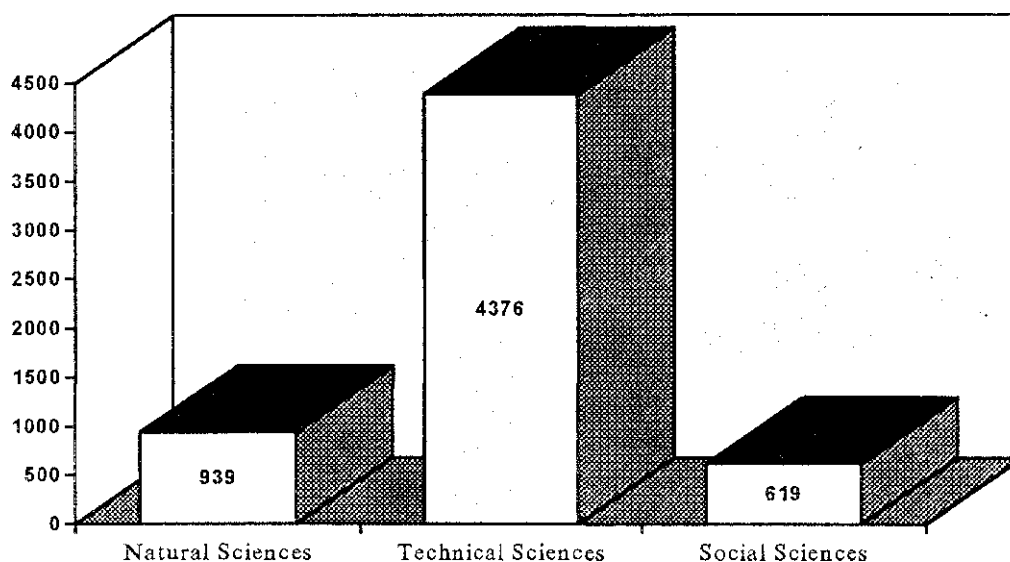
Some one fifth of the scientists gone off are holders of scientific degrees - Ph.D. or Doctorates.

DISTRIBUTION OF SAMPLE SCIENTISTS BY SCIENTIFIC DEGREE



Particularly interesting are the specificities among the study sample reproducing the changes taking place within all the Bulgarian scientific community. Specifically so the gone off distribution by the kind of scientific organization and the field of scientific activity.

### GONE OFF BY FIELD OF SCIENCE

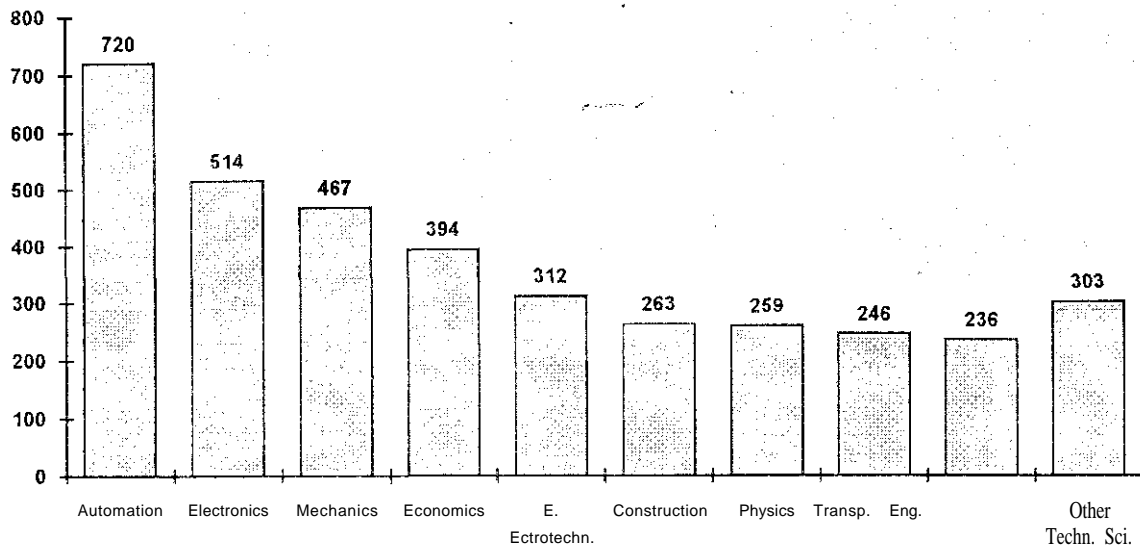


The data collected are only in accord with previously quoted research results, as well as with the repetitive publications concerning the particularly hard blow inflicted on the research and development units which served the rear scientific reserves to the Bulgarian industry. Losses have been most in the technical sciences - 72.9% of the whole community; as against 15.8% in the natural sciences and only 10.4% in the social sciences. Quite rewardingly the data obtained by this research conform with the trends described in the first section on the basis of the statistical data which comes to prove the reliability of the method of research chosen and of the data thus obtained.

Losses have been the greatest in the so called R&D Departments and institutes where the best part of our engineering potential in the technical field used to be concentrated - 54.6% of all gone off. In comparison the losses suffered by the Bulgarian Academy of Sciences and the higher educational institutions although considerable as well, have not been as dramatic as those (24.5% for the BAS and 16.9% for the universities). Quite with the expectations there has practically not been any scientist brain-drain from the non-government research establishments.

The research gathered information as to the specific scientific subject areas of the scientists left. The National Institute of Statistics has classified 47 of those, so we had to feature only the most characteristic in quantitative terms. Below is the distribution of the 10 subject areas having suffered the hardest losses:

## SOME SCIENCE SUBJECT AREAS SUFFERING GREATEST LOSSES OF SCIENTIFIC POTENTIAL

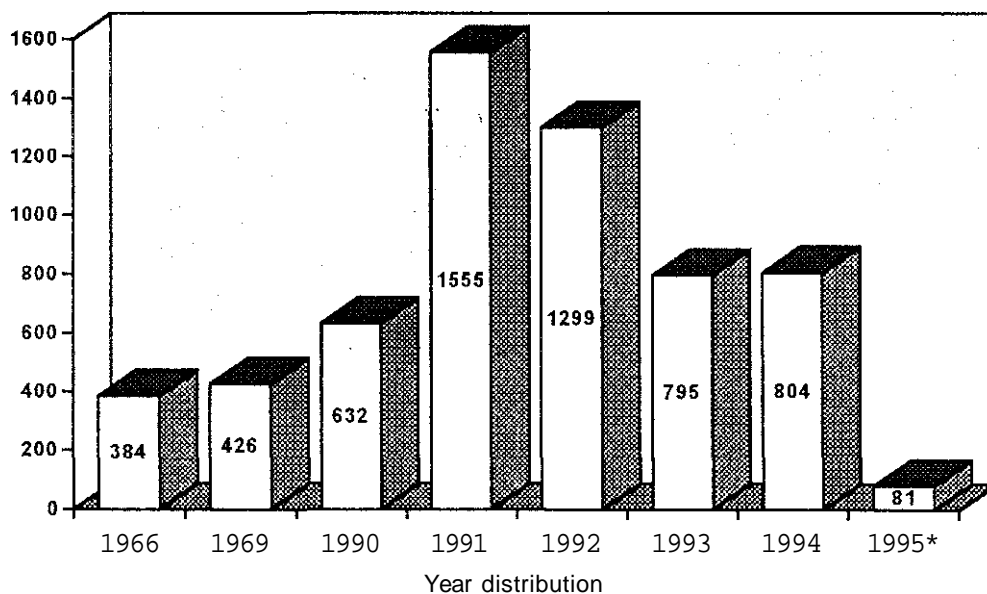


Science subject areas

Applied scientific areas like automation, electronics, electrical engineering and mechanical engineering are obviously among the most suffering of the real migration. Of the fundamental sciences losses have been most significant in physics and biology as shown above.

When did all these losses of scientific potential occur? In other words what was the timing of the outflow of scientific experts? The data shows that the process of real migration has been in its high in years 1991 and 1992 clearly standing out in the numbers of scientists who have left.

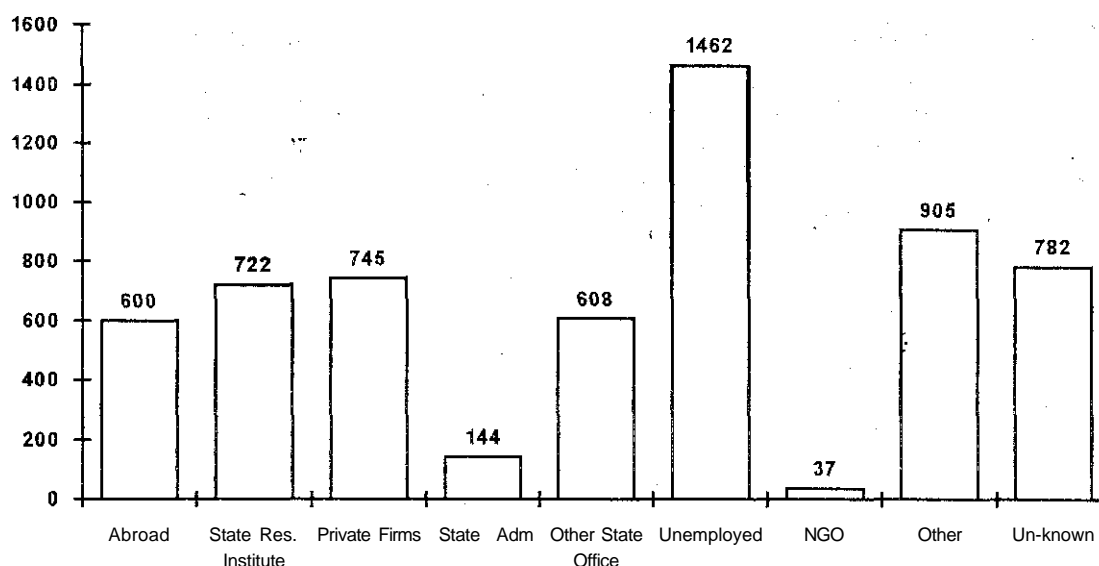
## REAL SCIENTIST MIGRATION DISTRIBUTION BY YEARS



Leaving out the 1995 data as incomplete the following dynamics can be outlined in the real migration of scientists in Bulgaria. If the 1988 level which is a yearly 384 - 6.4% of the sample - is taken as basis for comparison; then a slight rise is observable as early as in year 1989 when 426 left, or 7.1% of the sample. This gradual is the increase in the following year 1990, too, to go on to years 1991 and 1992 - the two most unanimously difficult years of the transition to the market economy, when the number of those gone off is several times that of the previous years. Thus year 1991 has seen 4 times more migrant scientists than 1988, and year 1992 - 3.5 times more. In the next two years scientist outflow becomes more stable, but retains twice the 1988 values.

To finish off with this part of the analysis we have to look into the destinations scientists have headed for. The answer to this is in the following

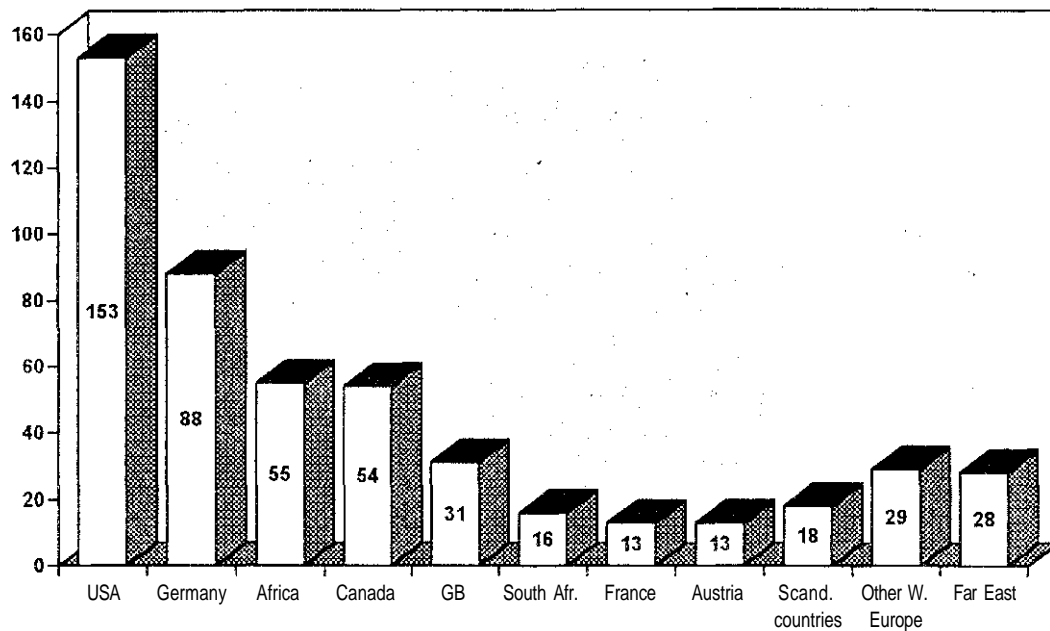
#### REAL MIGRATION DESTINATIONS



The data reporting as many as 600, or about 11.5% of those under research, having gone abroad is amazingly consistent with previous results of potential migration research in the early 90-ies in Bulgaria. About 10% of the Bulgarian scientists were reported there positively willing to work abroad. The chart shows also that comparatively few of those gone off - some 13,8% have resumed their scientific activities in other state scientific institutions. Their percentage is almost equal to that of the scientists who have moved to work in private research firms which is 14,3%. Largest is the group of those gone off and remaining jobless - 28%, itself a virtually irreparable loss of staff qualification.

The research attempted to specify the exact whereabouts of those who had gone abroad. Of the 600 scientists reported to have gone abroad we traced 544. This relatively high percentage allows us to claim an approximation of the real picture of the emigration destinations. The next chart shows the 11 countries with most numerous scientist migration from Bulgaria.

### SOME COUNTRIES HAVING RECEIVED MOST BULGARIAN SCIENTISTS

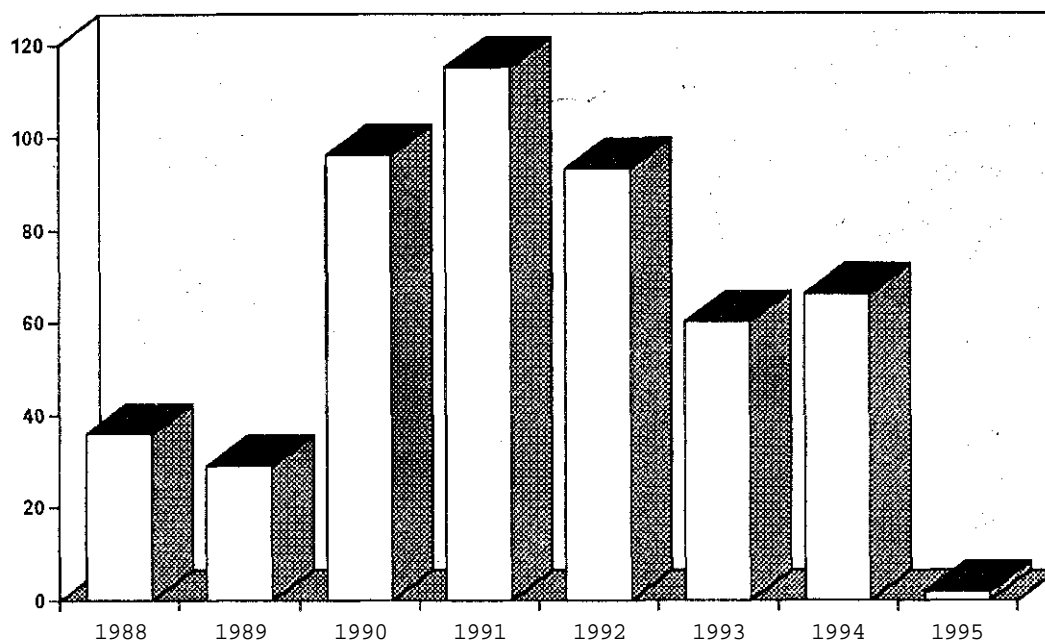


Results point out that Bulgarian scientists emigrating abroad are heading for two major destinations - North America (28% for USA and 9.9% - Canada) and Western Europe (16.2% - Germany, 5.7% - Great Britain, 2.4% each - France and Austria, 3.3% - the Scandinavian countries and another 8% for other countries in the region). These two regions can be said to be the receivers of about a third each of the Bulgarian scientist emigrant flow - America of some 38% and Western Europe of about 35%.

Among the remaining destinations major is the emigrant flow heading for Africa - some 13% (South Africa mainly), followed by Japan and the Far East - over 5%, some Central European countries (about 5%), Australia and New Zealand (1%) and others.

The data concerns all the 600 scientists known at their Personnel departments to have emigrated abroad. Some 9/10-s of them, that is 497 of the sample go with the exact year of emigration.

## DISTRIBUTION OF SCIENTIST EMIGRANTS ABROAD BY YEARS



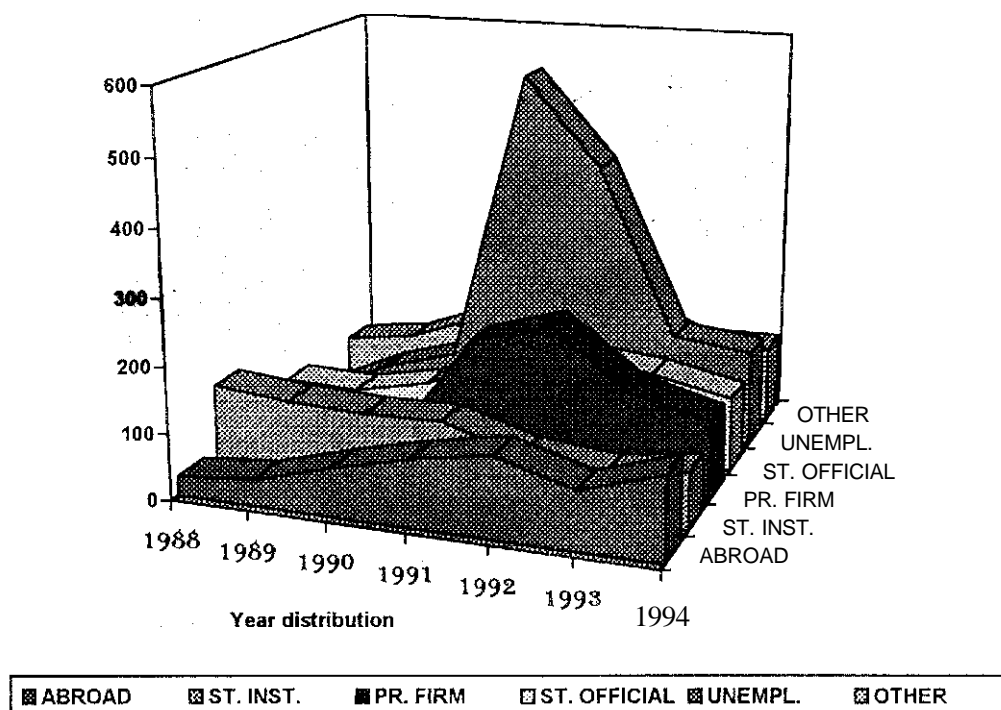
The dynamics of emigration to foreign countries is by and large coinciding with the yearly dynamics of real migration of scientists in general. The offset of the democratic changes in 1989 seems to have slowed down a bit the emigration rate to further enhance it steeply in 1990 with the opening of borders and the aggravating economic situation in Bulgaria. Although certain drop noticeable in emigration after year 1992 the numbers remain twice or so the 1988-9 levels. What needs to be emphasized here is that only the real migration has been the subject of research - that is those who have settled down and taken jobs abroad. The actual number of Bulgarian scientists residing abroad can be assumed to be several times higher with respect to those on long-term study or business trips sent by their institutions.

### *2.3. Some Additional Characteristics of the Real Migration of Bulgarian Scientists*

We are going to concentrate on the diversity of destination and volume of real migration of scientists and the ways they have been affected by the scientific subject area, institutional identification, year of going off, age and professional characteristics. Immediately obvious from the analysis of the data comes the high degree of interrelatedness of follow up realization with the above stated characteristics. The correlation coefficient  $X^2$  proves significance  $>0.0001$  for all of the below represented interdependencies.

What are the real emigration destinations in the period under research and are there any intrinsic differences with the years?

## REAL MIGRATION DISTRIBUTION BY DESTINATION

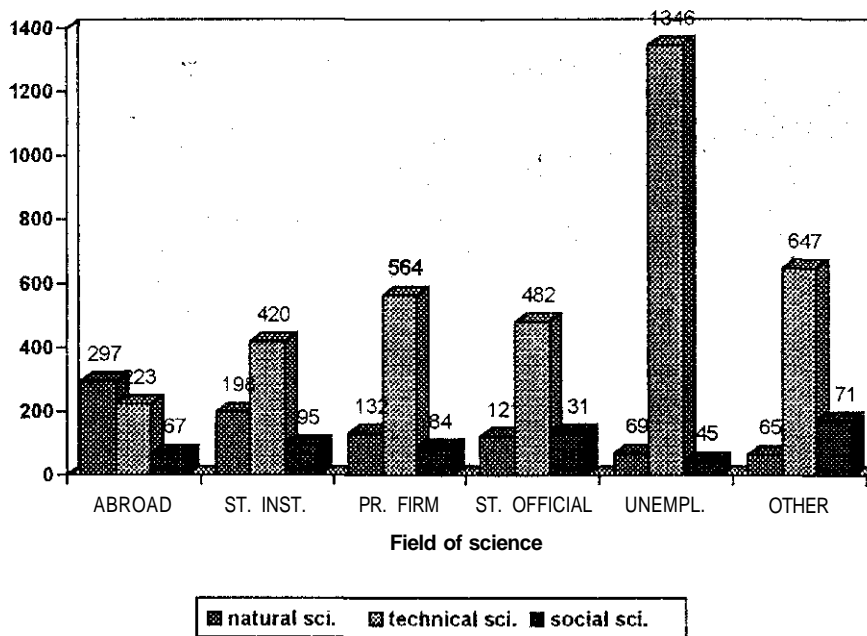
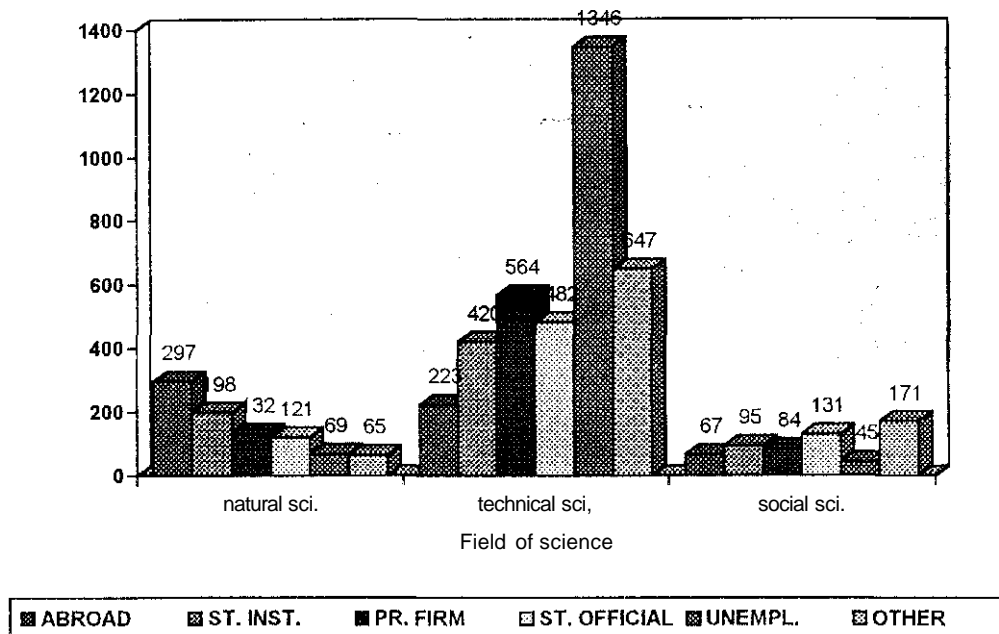


The given chart is illustrative of the relative weight of the different migration destinations with the years. The emigration abroad gradually rises to remain relatively stable after year 1991. Similar is the unemployment curve. The movement from science into state administration and management becomes more and more obvious especially in the recent years. The process of labour force reorientation from science to the private sector is a natural tendency allowing controversial interpretations. On the one hand the loss of scientists having orientated towards the non-scientific sector can be estimated in negative terms as "internal brain-drain". This process started about year 1990 and is less conspicuous in the last two years. On the other hand the formation of the Bulgarian private sector out of highly qualified specialists with scientific background can certainly be appreciated bearing in mind that the private sector plays major part in the economy. As research data shows, as well as statistics, the major outflow of scientists is constituted of representatives of applied sciences which helps draw the conclusion of the positive effects of such entrance on the private sector development. Most importantly the different flows of scientists to various branches and fields, in Bulgaria and abroad show enormous specificities which will be the subject of the next part of our analysis. As it turns out it is more difficult to talk about the processes of real migration in general terms since the characteristic differences are great between those entering the private sector and those emigrating abroad and still more so if those remaining unemployed are taken into account.

Let us now delve into the dynamics of real migration by scientific fields and scientific institutions.



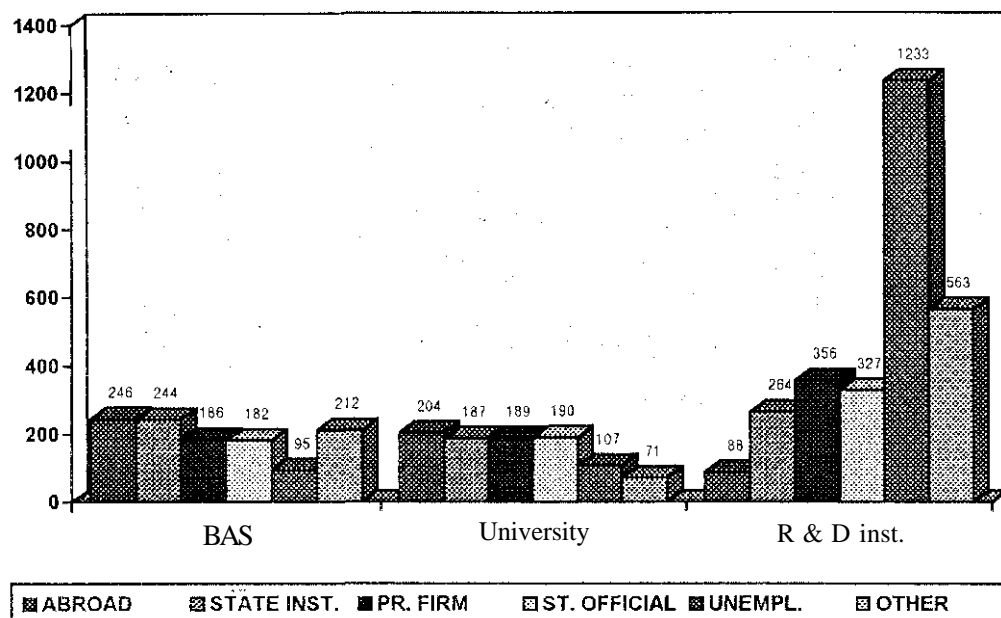
## DYNAMICS OF REAL MIGRATION BY SCIENTIFIC FIELDS



The profile of each of the major scientific fields goes deeply specific and differs from the rest. With the social and natural scientists unemployment is secondary in importance, while in the technical sciences it is relatively most significant. Technical sciences differ from the other fields in the relatively large number of scientists moving into the private sector and come close to the natural sciences in terms of emigration abroad. Emigration abroad itself is relatively most significant in natural sciences migration, while in the social sciences it is

considerably lower. The transfer from one scientific institute to another, that is the internal mobility, is higher in the natural and social sciences. Viewed from the angle of generally low real emigration in the social sciences, relatively highest is the percentage of social scientists who have changed jobs into state administration.<sup>1</sup>

#### DYNAMICS OF REAL MIGRATION BY SCIENTIFIC ORGANIZATIONS

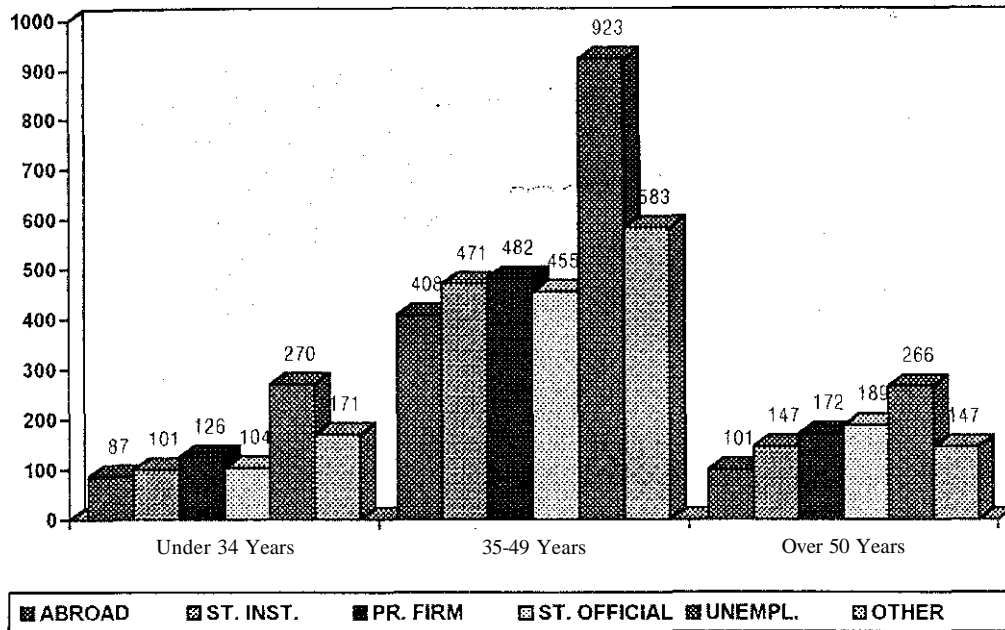


Again obvious is the significant diversity in the real migration destinations depending on the kind of scientific organization. Unemployment prevails among scientists from R&D institutes having served the previously socialist industry. The R&D institutes also differ from the other two kinds of scientific organizations in the much higher number of scientists who went into the private sector. The research showed considerable similarities in the real migration in the Bulgarian Academy of Sciences and the higher educational establishments - common high emigration abroad and internal scientific mobility with low unemployment.

It is time to consider the age and professional characteristics of scientists in terms of how they have affected real migration destination.

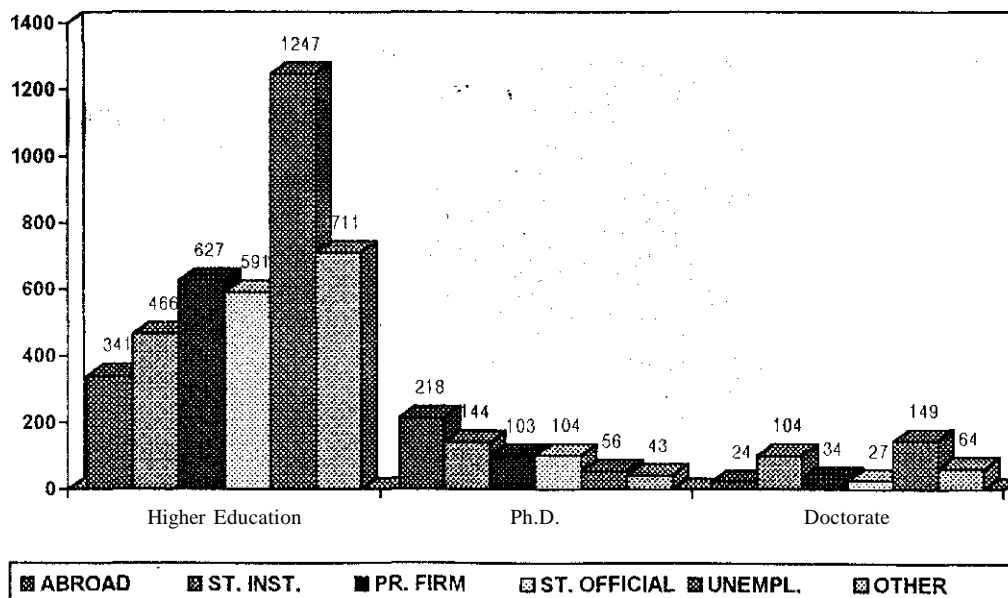
<sup>1</sup> As to the low real migration reported in the social sciences it should be observed that the research has not covered the scientific organizations which had already ceased to exist in the period of research. Examples of this kind are the former Academy for Social Sciences and Industrial Management, a whole lot of social sciences institutes at the Presidium of the BAS, at the Central Committee of the Comsomol, at some ministries etc., all of which served the political system before year 1989.

## DYNAMICS OF REAL MIGRATION BY AGE OF SCIENTISTS



We rearranged the originally gathered age data into three groups - young scientists of age under 34, scientists in their mature age of up to 49 and scientist older than 50. As seen from the chart unemployment is equally most important for all the three of the groups, but with mature scientists it is much more conspicuous. Young scientists are relatively evenly distributed in the remaining destinations - emigration, change of institute, private firm or state service. The distribution is similar among the scientists of mature age. Among the over 50-year-olds emigration is lowest with respectively rising numbers of those having changed institutes, entered private companies or taken up other state service. All in all by this feature most affected by the real migration turn out to be the scientists aged between 34 and 49, that is in most cases scientists in their prime as such.

## REAL MIGRATION DYNAMICS BY SCIENTIFIC DEGREE

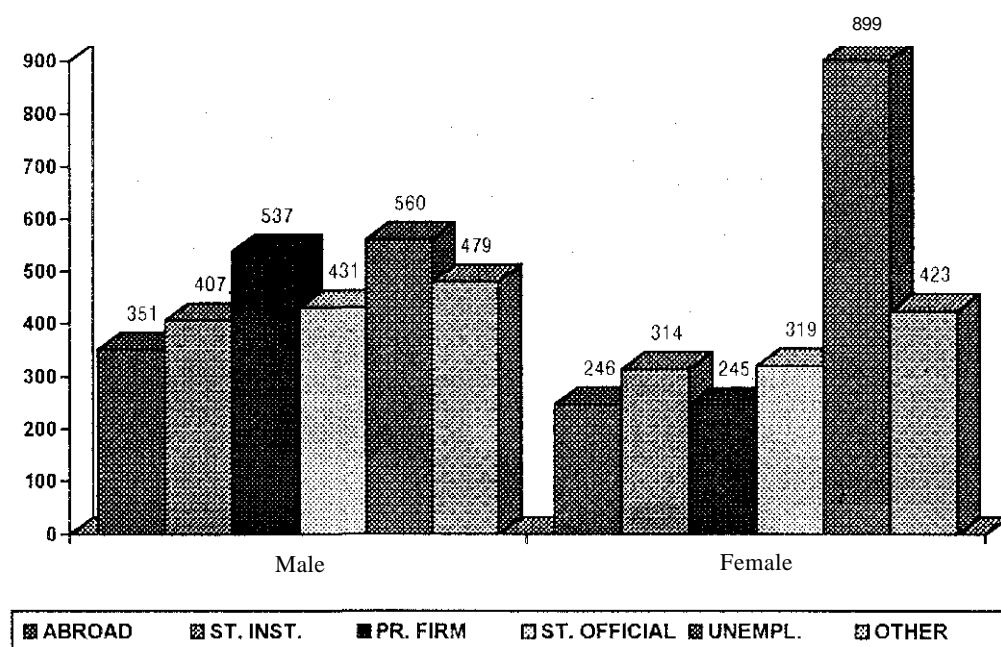


Evidence shows that in the hard years of transition the science in Bulgaria has managed to preserve the most qualified part of its research potential. Actually with the Ph.d. holders the single more significant factor is emigration abroad - unemployment is lowest with them. And with the generally very low real migration among the Doctors of sciences what stands out is only the percentage of unemployed. ....-.-

It is clear that the burden of the transition has been taken by those with completed degree courses and engineers with no further scientific degrees - unemployment among them is very high and the jobs they have found are in the private sector or civil service. Comparatively smaller, but high enough in absolute terms, is the share of those resuming their research activities in other state institute, or emigrating abroad.

Are men and women scientists equal in real migration terms?

### DYNAMICS OF REAL MIGRATION BY SEX



Two are the major differences in the dynamics of real migration in respect to scientists' sex: first, the share of men who have taken private business jobs is considerably higher than that of women; and second, the unemployment among women scientists is over 1.5 times higher than among men.

Finally we would not like to leave unnoticed the visible size of the heading "other" in almost every one of the charts in this section. The cases were included here either because the personnel officers were unable to supply information on the specific feature, or a scientist's situation after going off does not fall under any of the categories suggested. Hence the distributions given should be the deviation from the real situation so much more so the greater the values under the heading "other". We could claim in this respect that the so presented picture of real migration in its dynamics is close to reality.

## 2.4. Is There Brain Drain from Bulgaria?

It is definitely there if by brain-drain in the period of transition to democratic society and market economy we understand scientists leaving the country for periods longer than one year with the purpose of a long-term stay or settling down in the other country, where the scientist is professionally engaged in scientific work - yes, such a process is observable in Bulgaria. It was only advantageous that the research was carried out in late 1995 enabling us to trace the whole history of the process, its forms of occurrence and destinations. As already pointed out above the process is slowing down in terms of numbers of people after year 1992, yet a permanent outflow of scientists to foreign countries is recognizable.

This process can hardly be formally expressed in quantitative terms, but of all scientists left, for abroad only 13% are engaged in scientific activities professionally - that is in its best part the emigration of scientists is virtually a brain-drain process.

Another argument in favour of the above is that if all scientist outflows are put together and their qualitative characteristics juxtaposed - of all gone abroad, into the private sector, into public administration, or become unemployed - definitely those with most favorable professional and demographic characteristics have gone abroad. Along these lines qualified specialists being lost by our science is a serious problem. Undoubtedly serious are the problems associated with scientists turning their back to science and later remaining unemployed - those scientists are comparatively less favorably described by our study.

Here in the following chart are the results of such a cross-study:

### BASIC CHARACTERISTICS OF SCIENTIST OUTFLOWS \*

	<b>Emigrants</b>	<b>Unemployed</b>	<b>Into Private Sector</b>	<b>Other Research Employment</b>	<b>Public Administrations</b>
<b>Age</b>	35-39	40-44	40-44	40-44	45-50
<b>Research institute</b>	Academy	State Ins out of BAS and Univ.	Companies' Research Instit.	BAS Univ.	State Inst.
<b>Sex</b>	Male	Female	Male	Male	Male
<b>Place of Graduation</b>	Western Country	East Europe, BG	BG	BG	BG
<b>Scientific degree</b>	Ph.D.	Non	Non	Higher Than Ph.D.	Ph.D.
<b>Postgraduate specialization</b>	Yes	No	-		
<b>Scientific Field</b>	Natural Sc.	Engineer-Technical	Engineer-Technical	Natural	Social Sciences

\* The characteristic common to most belonging in the respective group is marked with (\*)

The data on the ages of those gone show that the most favorably aged in terms of creative ability have headed predominantly for private companies and abroad, while the older scientists have gone into public administration.

More conspicuous is the brain-drain from the Academy of Sciences. Those left and remaining unemployed are mainly from the institutes formerly existing at certain ministries and central government establishments - they generated 84.7% of the unemployed scientists. At the same time 50% of the ex-employees of institutes at industrial enterprises have started as private entrepreneurs on their own.

As stated above the data show that women scientists stand unequal to men. Before the reforms the position of a scientist used to be considered very comfortable for women - it was not particularly well-paid, but was secure for that matter and offered flexible working hours placing little physical demands on the performers. That is why certain scientific areas were , artificially represented by women predominantly. The reforms starting faced scientists with the challenge to prove their abilities, flexibility, professionalism. This must have been the major reason why most of the women were unable to adapt to the new conditions. Only 9.5% of the women having left science have gone into private business. 889 remained unemployed of all the 1,459 women gone off science.

Scientific degree is a formal criterion of integrating somebody into the scientific community, of recognizing their professional abilities and experience. Formal as this criterion may seem to be it still is indicative of a scientist's professional development. So not in the least surprisingly among the unemployed there are only 8.4% holders of scientific degrees. Among the emigrant scientists-those with scientific degrees are twice as many as those remaining unemployed and three times more than those taken up jobs in the private sector and 8 times more than the public administrators. The scientists holding degrees higher than Ph.d. went mainly to other scientific institutions which can be attributed to their usually older age - itself limiting the perspectives of changing jobs - and the fact that they were normally given preference to when sitting for contests at scientific institutions. ;•

The scientists who emigrated abroad had been on study trips abroad more often than the representatives of the other outflows from science. Studies abroad prove to have been important factor in the scientist's preparation as contact forming and good for making arrangements for the trip to follow. 50.6% of those emigrated had previously been on study trips abroad. Importantly so only 3% of the unemployed and not more than 10% in the remaining categories of scientists had specialized abroad. Obviously the emigrants did use to be more successful in certain respects than their colleagues which leads us to the assumption that they must also have been the better in many respects.

Taking a degree abroad is also essential for prospective scientist emigration. Data is positive that those who have taken degrees in a Western country emigrate more often than those who have completed their higher education in another former socialist country or in Bulgaria. Having been trained in a Western university is in many respects advantageous for the scientists - the language and all the remaining things going with this kind of degree. 22.8% of the scientists with degrees obtained in Western countries have emigrated as against 13.3% having graduated universities in the east and 11.3% - in Bulgaria.

**Which** are the scientific areas suffering most brain-drain? The following chart is evidential as to the numbers of scientists who have emigrated of all abandoning scientific institutions. Those are taken into account whom we managed to obtain information of their whereabouts and only areas with more than 200 of those were considered significant enough to be given **here**.

**SCIENTISTS GONE ABROAD BY SCIENCE FIELDS  
(% OF ALL LEFT)**

Medicine	67.3
Chemistry (Fundamental)	32.7
Civil Engineering	31.0
Biology	30.0
Physics	23.1
Geology	22.1
Applied Chemistry	18.0
Mathematics	9.7
Mechanical Engineering	7.7
Construction	5.6
History	5.6
Economics	4.9
Electronics	3.9
Automation	3.3
Energy	2.1
Electrical Engineering	1.1
Transport	0

Data shows as most affected by brain-drain the areas of theoretical chemistry, biology, medicine, civil engineering. Lowest is the percentage in the technical and engineering fields. The above does not take into account the less numerous scientific areas remaining statistically unobservable, but depriving Bulgaria of whole sectors of science or big scientific projects if the few scientists working on them left the country.

**4.5. Opinions of Directors for the Brain Drain Flow**

It could be asserted from a methodological point of view that the data extracted from the interviews with directors of scientific institutes and deans of Universities represent the general opinion of the leaders of Bulgarian science, as far as it includes all the kinds of institutions in all fields of science, although the selection does not meet the statistical requirement for the term "representativity".

The 107 institutes that have been interviewed are as follows: Natural Sciences - 47, Engineering / Technical - 36, Social sciences - 24. The highest number of the questioned represented in the poll are from institutes within the Academy of Science and as the data above showed, that is where the highest brain drain flow is registered. All that reasons an actual and most impartial information on the process and its influence on the course of scientific researches, the importance and purpose of science.

The data shows that only 32 institutes or approximately 34% of all, and whose directors have been interviewed, did not register scientists that have emigrated abroad. The directors claim that they have information showing that 58.55% of the people who left the country continue their activity and researches abroad. As for the rest, they do not have information whether they still practice their profession.

The institutes that suffered the highest brain drain flow are the Biology Faculty of the Sofia University, the Mathematical Institute, the Catalytic Institute, the Physics Institute of the Sofia University, the Cryogenic Institute, the Chemistry and Technical Institute, the Genetics Institute, the Organic Chemistry Institute, the Development and Implementation Center for Fine Soldering, the National Hematology Center, the National Molecular Biology Institute, the Radioelectronics Institute, the Immunology of Reproduction Institute, the High Institute of Zoo engineering and Animal Medicine, etc.

The importance and the level of the institute play as an important role for the migration intentions, as the individual qualities of the scientist themselves. It is not a coincidence, as shown in the data, that the institutes which had given way to the highest emigration flow, were involved to a higher extent with international projects and had closer relations with the international scientific society.

118 of the 567 scientists who have emigrated abroad have returned, shows the information of the directors of the institutes, i.e. 20% and in most cases they prefer the institute from where they had left. That is a beneficial prerequisite for implementing the experience and professional skills that they have acquired abroad upon return to their country.

The institutes represented in the poll include: 44, which were participating in research projects of the European Union, projects financed by UN organizations - 18, USA programs - 22, foreign firms - 11 and other international sources (including bilateral programs, private foundations and others) - 24. That stands for an active international scientific exchange. Unfortunately those international projects are implemented in a very few number of institutes. Some scientists have never worked on international projects, while others have worked on several such activities.

The evaluation given by the directors of the process of emigration of scientists is rather ambiguous. It depends not only on the atmosphere in the institute, but also on their personal beliefs and attitudes. In general, the directors do not dramatize the adverse effects of the process and are trying to balance, be at the same time perspective thinking and solve the problems that science is facing at the moment. The most important tendency, however, is the



positive attitude that directors have towards the process of opening the Bulgarian science to contacts and joint scientific activity with developed countries and with that overcoming the isolation and restrictions that were imposed on it. That is the reason why the brain drain process is viewed as a period which is over and also as a kind of "price" which science is paying in exchange for its sociability. The evaluation of the emigration process of scientists is closely related to the extent to which that process effected institutes themselves. The data shows that the directors of institutes with no emigration flow did not have an opinion or did not consider the problem to be of serious importance. On the contrary, the effect on the institutes with considerable emigration flow, is highly negative. The directors stress on the fact that certain research programs could not be implemented because of the emigration of scientists, for example in the Mathematical Institute, the Genetics Institute, the Organic Chemistry Institute, the Development and Implementation Center for Fine Soldering, the Molecular Biology Institute and others. That caused considerable alteration of scientific programs in the respective institutes.

In general the prevailing estimation is that the brain drain process had a negative effect on the activity of the institutes, but the process eventually died away and the activity has been restored and new people have come.

The data indicates active scientific exchange at the present moment. While 576 people from the 106 institutes have emigrated, 530 are abroad under some kind of scientific exchange - that equals the number of people who left for the whole period after the changes. That is extremely important. It is also significant to notice that the scientific exchange is oriented mainly towards European countries, while the brain drain flow was directed mainly towards the USA.

The joint scientific project and short-term specialization programs are in effect the most popular form of scientific exchange. The data from other countries show that those forms are among the most common mechanisms for scientific exchange.

100 scientists from the 107 institutes, included in the poll, are under some kind of short-term specialization program abroad. And 102 scientists have their post-graduate qualification programs abroad for a period longer than 3 months.

47 scientists attend programs for acquiring higher scientific degree. 182 scientists work under a joint research project abroad. 50 scientists are involved in some kind of joint activity - conferences, working groups, etc. - at the time the poll is taking place (July 1995). That comes to show that scientific contacts and joint scientific activity are really gaining speed.

The survey of the potential migration of scientists included questions allowing the scientists to openly express their attitude to the processes of scientist migration. Two points of view stood out as prevailing: While most of the scientists evaluate the process in the negative as regards the country and the science itself, at the same time the opinion suggested itself that for the scientists themselves its effects are extremely positive. That is why there is no one-sided evaluation to it.

The extreme negative assessments have to do with the fact that science is deprived of good specialists and their research work.

The positive evaluations have to do with the personality aspects, with the opportunities those who emigrated to gain experience and professional accomplishment. On the occasion of migrant return they are expected to contribute a lot to the development of both science in general and the institution in particular.

Unlike the directors the rest of the scientists show much greater involvement in the evaluation of the scientist migration: while directors were indifferent or neutral in their comments in most cases, the rest of scientists responded most often in the negative.

The process of scientist emigration is multifaceted and lacks inner homogeneity. Its causes, forms and directions go astray from the general emigration trends. If for instance the major scientist destination is USA migration has generally been towards Germany (with the exception of that of ethnical Turks). While by and large migration was most numerous in 1991 with the scientists year 1992 was the "peak" year. These specificities prove once again the necessity to study in detail the motives, causes and mechanisms of scientist migration, which comes one of the goals of the study of potential migration.

## CHAPTER 3

### POTENTIAL EXTERNAL AND INTERNAL MIGRATION OF SCIENTISTS

#### 3.1. Methodology

The potential emigration of scientists has been subject of little research in Bulgaria, and in most cases as part of the larger-scale research of migrational processes here from the early stages of the reforms. According to a study of the potential emigration of Bulgarians travelling abroad<sup>1</sup> in year 1991 - the year of the mass emigration waves some 30% of the travel flow leaving the country intend to emigrate, with 5% of the respondents claiming they would do their best to emigrate for 1 year or more, and 26% would take any opportunity to settle down abroad.

Different studies employ different conceptual frameworks as to what potential migration is, how it is measured and what are the methods of its research. Their results can hence only in some cases be used to trace the dynamics of the process. According to the research carried out by the International Migration Organisation in 1993<sup>2</sup> migrational attitudes should be measured by the answers to one question, whose answers go like that:

#### WOULD YOU GO ABROAD?

	Very likely	Somewhat likely	Somewhat unlikely	Very unlikely
Travel for a short time as a tourist		17	23	23
Live and work abroad for a short time	12	16	28	37
Live and work abroad for several years	8	12	25	47
Move abroad to the end of your life	3	3	11	70

The estimated certain potential migrants are some 11%, with 3% settling down. Among those with higher education this percentage is 4%.

<sup>1</sup> Y.Kalchev, S.Tsvetarsky "Potential Emigration of Bulgarians Travelling Abroad", 1991, pp 16  
18

<sup>2</sup> Bulgaria: Migrant Profile Project (Country File), January 1993, IOM

The potential migration of scientists in Bulgaria has been studied among other things in quite some surveys, which in their sequence allow to follow the development of the processes.<sup>3</sup>

A more comprehensive study of the brain-drain from Bulgaria was undertaken by the Institute of Social Science in 1993. It sampled 8% of the scientists in the BAS, the University of Sofia, the University of National and World Economy and the Technical University.<sup>4</sup>

The present survey is the first attempt in Bulgaria to carry out an integral study of emigration - internal and external migration of scientists in the unique historical moment, which is the transition to democracy and market economy. Some of the issues under research now go parallel with previous research, particularly the one under the guidance of Iv.Chalakov, which provides basis for comparisons.

### *3.2. Socioeconomic Status of Bulgarian Scientists*

The research made it possible to estimate the living standard and the labour conditions of the Bulgarian scientists. This part of the research comprised two kinds of questions - fact-finding and evaluative. Both kinds of questions render the cross-country comparisons demonstrative of the actual condition of the national scientific potentials and its perspectives for the future. The representability of the sample projects findings onto the whole scientific community and the compatibility of the data across countries makes it possible to draw important conclusions and elicit recommendations.

Data show that as against previous research scientists' families have achieved better material status in terms of ensuring material comfort

<sup>3</sup> A research of the Institute for Demography was carried out in the spring of 1993 and covered the BAS scientists, who had left the country for the period from 1990 to 1992. 5.86% of BAS scientists are found to have emigrated for the three years in question.

A representative survey was conducted in 1989 by the Institute for Social Science featuring the 'Potential Emigration of Scientists from Bulgaria in the Condition of Alleviated Passport Regime'<sup>1</sup>.

A cross-country/Albania, Bulgaria, Russia, Ukraine/ study was carried out in 1992 entitled 'Profiles and Motives of Potential Migrants'.

<sup>4</sup> 'Potential Emigration of Scientists from Bulgaria: Flow and Perspectives,' BAS, 1993, Ivan Chalakov in charge

**PERCENTAGE OF SCIENTISTS HAVING ACQUIRED THE FOLLOWING:**

	<b>1989 Research</b>	<b>1993 Research</b>	<b>1995 Research</b>
Own lodging	<b>69</b>	80	87.7
Country house	<b>15</b>	<b>21</b>	31.2
Colour television	<b>72</b>	87	95.1
Video-cassette recorder	<b>8</b>	<b>29</b>	50.4
Personal computer	<b>4</b>	<b>12</b>	26.5
Telephone	76	80	80

As against the other CEE countries Bulgarian scientists have about average living standard, if their material comforts are measured in quantitative terms.

**PERCENTAGE OF SCIENTISTS HAVING THE FOLLOWING MATERIAL ACQUISITIONS:**

	<b>Own Lodging</b>	<b>Country House</b>	<b>Computer</b>	<b>Foreign Currency Bank Account</b>
Poland	76.3	19.7	<b>45.9</b>	64.1
Hungary	84.7	23.2	46.9	79.7
Czech Republic	57.9	43.3	47.3	40.4
Latvia	35.4	24.1	<b>9.8</b>	<b>9.2</b>
Slovenia	84.5	26.4	75.7	79.3
Estonia	77	43.9	26.0	10.5
Romania	77.6	13.0	18.7	10.5
Slovakia	71.6	29.1	38.0	37.8
Lithuania	88.9	22.0	13.0	20.5
<b>Bulgaria</b>	<b>87.7</b>	31.2	<b>26.5</b>	28.4

88.7% of Bulgarian scientists own the place they live in. /They come second in this after the Lithuanian scientists among all CEE countries/. It goes without saying that not so much the ownership itself of a place to live, but rather its size and quality must be the criteria for the material status of the scientist.

31% of them own a country cottage /The Czechs and Estonians only can boast of that more often/. As in all other countries over 85% of the scientists in Bulgaria have an automobile, colour television /most scientists having that in Bulgaria - 95% as against the other countries/. Bulgarian scientists lag behind most of the scientists in the countries of transition in the use and ownership of a personal computer. As data show countries vary hugely in different respects. While only 9,8% of Latvian scientists have at their disposal computers at work, in Slovenia their percentage is 75%.

The foreign currency account can be additionally indicative of the material condition of the scientists, and also be indirectly demonstrative of contacts abroad and incomes from there. Countries vary considerably. This particular index interpretation should take into account how sincere the answers have been in view of the fact that even laws protect this kind of information. Some 28% of Bulgarian scientists have declared to have foreign currency deposits, which is considerably less than in Central-European countries, but more still than the Baltic countries and Romania.

The cross-country data, Bulgaria included, show a comparatively high diversification of material condition of scientists. Some of them live poorly, and others have living standard much higher than the average Bulgarian. In other words, the general processes of growing inequality within post-socialist countries hold for the scientists as well.

If respondents have been honest in their answers, it can be asserted that 71.6% of Bulgarian scientists do well, 19% save up, while about 10% of the scientists live on what they have saved before and get into debts. 63.5% of them think their financial condition has got worse after the reforms. Bulgarian scientists turn out to be more critical than their colleagues in most CEE countries. Although, as above evidence shows, most of them have practically acquired important objects and property, still in many cases they consider their material condition worse. Among Polish scientists the share of those thinking their condition has worsened since the beginning of reforms is 40.6%, Hungarian - 52.8%, Czech - 30.1%, Latvian - 70.5%, Slovenian - only 21%, Estonian - 56.1%, Romanian - 56.9%.

In the conditions of limited opportunities for budget financing of science scientific institutions and scientists themselves should be as flexible as possible in finding alternative forms of funding scientific activities and providing extra income and hence keep qualified specialists in science. The study found some interesting trends in this respect.

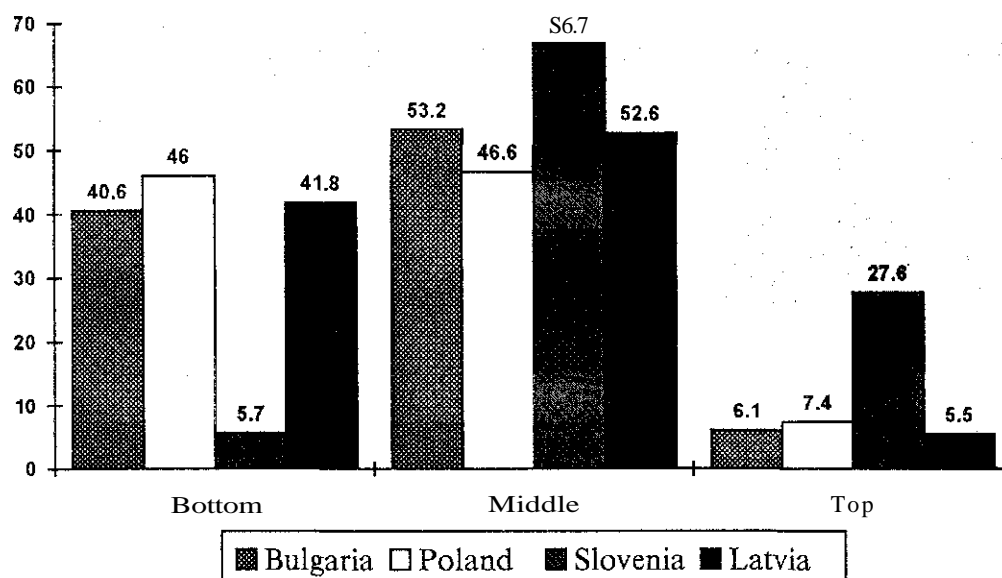
Only 8.8% of the scientists depend solely on their salary as income source, and about half of those surveyed claim their salary is less than 50% of their income. This is a fact to be rightly estimated only if the other alternative sources of income scientists have at their disposal are evaluated. 12.0% have a second part-time job at another institution to do with science, 12.4% take part-time jobs outside science, 6.7% do occasional odd jobs within science, a scarce 6 - 7% are self-employed without science, 16.7% deliver lectures over-time and regularly get extra income from that. Most common are the occasional scientific contracts - 44% of those sampled get additional income from occasional projects and contracts and the contractual services provided. Publications are another source of income for 34% of the scientists.

The traditional extra sources of income like research contracts, publications, lectures remain relevant and considerably important. Still other forms of additional income providing appear and gain popularity like for instance - independent commercially-oriented scientific activities, employment at private companies dealing with science, etc. Quite a source of income are also the incomes coming from rents /6.7% of scientists/, interests and dividends /28.4%/. This variety of alternative sources of income is partially explanatory of the low scientists' salaries. In a sense it is the basis for rooting deeper into science of those who have remained within, still the existence of so much extra work-load and pressures hence apart from the basic full-time contract for the scientific institute poses the problem of overall performance. How far can a scientist do well within his own scientific area, if at the same time he is pressed to have a private firm, give lectures, sustain part-time contracts with other scientific institutions, etc. If scientists' pay went up, this would limit down the squandering of scientist's efforts and time, and would probably make him more productive in his own area. The stabilization of scientific potential is only possible if scientists were guaranteed income reliable and high enough under their full-time contracts. Data prove that despite of the variety of additional income sources the material condition of scientists is below satisfactory. This has been reflected in the subjective estimation of their place within the social hierarchy, which proves a major factor to build up scientist's confidence and behaviour. 52.8% of scientists place themselves as belonging in the middle class, but as a whole the scientists seeing themselves as coming lower in the hierarchy number much more than those claiming to occupy higher positions.

As against scientists from other countries Bulgarian scientists place themselves towards the bottom of the social hierarchy. Most favourable is the condition of the Slovenian scientists - some 27.6% of them consider themselves at the top of social scale and a scarce 5.7% - at the bottom. Most infavourable is the condition of Polish

scientists 46% of whom associate themselves with the bottom of social scale, 46.6% with the middle, and a scarce 7.4% - with the top in the social hierarchy.

#### SCIENTISTS' SELF-ASSESSMENT OF THEIR PLACE IN SOCIAL HIERARCHY



In conclusion it can be said that the material status of Bulgarian scientists, despite certain material acquisitions growing in quantitative terms, does not yet guarantee the stability of scientific personnel. The natural reaction to that is the escape into other forms of employment and earning income, which although positive in some of its effects /scientific experience and know-how implementation in other areas, improving professional skills by means of participating in additional projects and forms of employment/, can still be considered an indicator of scientist's insecurity and disappointing material condition. Scientist's living standard and public levels of appreciation of his work are also lacking in much incentive to remain within science. All these constitute an environment quite favourable for high internal and external migration attitudes. In this respect the relative drops of potential and real migration are rather illusive of stabilizing scientific personnel. As against the other countries Bulgarian scientists can be said to be more motivated in terms of their material condition to leave the country, much more so than the scientists in the Czech republic, Slovenia, Poland and Hungary.



### *3.3. Labour Conditions of Scientists*

Scientists conditions of work are an important element in the motivation structure of a scientist, and as research has shown they are more motivating for the scientist's behaviour than for the other professional groups. Evidence on the labour conditions of Bulgarian scientists lie grounds for expected high potential mobility from science. Important in this respect are not only the material conditions of work.

When asked whether they have access to enough topical information about the problems they work on, absolutely in the negative answer a scarce 1.6%, and few again - 15.4% answer absolutely in the positive. Bulgarian scientists' assessment of the extremely important in their professional activities access to topical scientific information is considerably less favourable than that given by their colleagues from the Central European countries. Full access to the scientific information they need have for example 27% of the Polish scientists, 37.2% of the Hungarian, 24,4% of the Czech, 32.9% of the Slovenian, 20.8% of the Slovak scientists. In full contrast with the Central European countries in Romania only 6.3% of the scientists state they have all the access they need to topical scientific information, and in the Baltic republics this share does not exceed 8%. Bulgaria evidently stands in between in this respect. The access to scientific information is dependent on the overall condition of science, the financial condition of the particular scientific institution, the intensity of contacts with the developed countries, as well as the access to scientific programmes and developed countries' assistance in this area. As will become clear in the analysis of the brain-exchange processes, although in-between in this respect Bulgaria should be encouraged to participate in this process and the involvement of Bulgarian scientists in European programmes for scientific exchange should become one of the major paths of strategic scientific development of the country.

There is a lot to be done to improve the conditions of work of Bulgarian scientists. As against the scientists from the other countries the Bulgarians work under much less favourable conditions than the scientists from Poland, the Czech republic, Hungary, Slovenia, and Slovakia. That is in this respect the Vishegrad three stand apart from the rest of the post-socialist countries.

### Technical Equipment for Scientific Work\*

	Meet international standards	Do not have the equipment they need
Poland	66.2	33.1
Hungary	<b>73.0</b>	27.1
Czech Republic:	62.2	37.4
Latvia	31.8	63.1
Slovenia	70.5	28.5
Estonia	38.9	61.1
Romania	26.4	72.2
Slovakia	50.4	48.1
Lithuania	28.0	69.6
<b>Bulgaria</b>	34.2	<b>65.3</b>

\* The percentages left to 100% did not answer.

The inadequate technical conditions for scientific work have to do with the low science expenditure. The situation is pretty complicated. As data show Bulgaria and Latvia spend the least out of their states' budgets on science and at the same time have no alternative internal sources of financing. As a result from that Bulgarian scientists make up for their low incomes by means of other employments and that is the reason why they still do scientific work /with all the infavourable consequences of that for the science itself/. This, however, does not solve the problems with the technical equipment, the supplying of necessary literature, study trips abroad, etc. - all those indispensable expenses to the existence of science so that any significant results be expected from it. To rely on international programs is not only insecure, but also quite hazardous as to prospects of scientific development. At the same time despite of the substantial reduction of numbers of scientists Bulgaria still sustains a fairly good number of scientists per head of population. This is a policy to be carefully given a second consideration in terms of a selective strategy. We believe it would be better to finance well and in accord with modern standards but fewer fields of science and in them the scientists will have the better status, all the technical equipment and information conditions they need for work. This would be a way Bulgarian science to manage and preserve, even expand its position in the science of the world.

Science administration and management, relationships within the scientific community underwent serious revisions and changes with the reforms under way. How far have these changes improved scientists' conditions and opportunities for work, though? How much more freedom has the scientist achieved in his/her scientific work?

These are processes not to be easily evaluated. The study did shed some light on the organization and the relations within scientific institutes, but of course all evaluations of this area should avoid being categorical.

It is worth observing that in the countries where scientists are paid lower and the financial conditions are poorer scientists more often work below their qualification. Unfortunately Bulgaria is the country where this happens most often. This is partly due to the mass discharges of technical staff in science. At least Bulgarian scientists choose on the team to work in more often than the scientists from the other countries covered by the research.

### *3.4. Factors of Long-term (Longer Than One Year) Potential Migration*

Traditional dependence measurements were applied to study the factor conditioning of migration behaviour of scientists. As long as most answers comprise nominal scales the Phi-index was used.

Three kinds of factors make up migrational behaviours of scientists:

#### *Individual Characteristics*

In the course of the research various demographic and professional characteristics of scientists were tested and their part in the moulding of migrational attitudes. Among the demographic ones were age, sex, education, marital status, relatives or friends abroad, number of children, age of children. Demographic factors play a smaller part on the whole. Age is visibly important among them.

Age is a factor of major importance in the potential migration of everybody and the scientists in particular. Young scientists are definitely more determined to leave the country and to work abroad for longer than a year. And this is not to do only with the traditionally higher migrational attitudes among youth as against the remaining

age groups. It is also connected with the high disappointment in their pay, with the career opportunities, with the available international contacts, with the life, organization and hierarchy within science, etc. The above was detected by other research as well, but stands out more sharply than ever now.<sup>5</sup>

The high potential migration among young scientists exposes Bulgarian science to the dangers of ageing, break of continuity, failure of research and overall incurable damaging. Special measures must be taken on the part of the state to encourage the young people to enter as well as stay within science. And that all CEE countries report of the existence of the problem does not lend itself to underestimations and become less significant for Bulgaria harsh as it is.

Of the professional characteristics what was studied were the years of experience, the scientific degree, knowledge of languages, publications abroad, administrative position, trips abroad, work on joint projects with foreign institutes. Strong professionally turned out to be the publications abroad, trips abroad and co-operation with a foreign institute. In other words - the scientist's connection with the international scientific community and his/her recognition abroad are factors determining both his/her attitude and opportunities for long-term migration.

Professional factors were proven more decisive than demographic ones in establishing migrational attitudes with scientists. This is a specificity in the motivational structure of migrant-scientists as against all other kinds of migrants.

- *Character of Scientific Institution*

While the individual characteristics influence along very similar lines the migrational attitudes of scientists in different countries as research shows, still countries vary significantly in terms of institution character, which has to do with the specificities of scientific institutes and the structure of science in different countries. Despite of the long years of attempted uniformization of scientific systems under the former COMECON only a couple of years after the reforms countries have already established their own institutional structures.

<sup>5</sup> "Bulgarian Scientists and the Changes in Science", team-work of Peter Balkansky, Stefan Doynov, Petko Bozhikov et al., Sofia, 1993, p 47.

As shown by previous research<sup>6</sup> one of the major factors contributing to the potential external migration of scientists is the degree to which the scientific institute has managed to become part of the world scientific community and to maintain contacts with counterpart scientific institutions abroad. Important on the other hand are also institute's place and position within the country - the stability of the institution and its staff, its financial condition, the organization of scientific activities and the relationships within are also essential. Fields of science whose scientific product is in demand face better prospects both in the country and abroad.

On the whole however Bulgarian scientists estimate the demand of scientific results as comparatively low. In all former socialist countries state is the major consumer of scientific results. The demand for scientific product on the part of the state is estimated as considerable by 59.9% of the Polish scientists, 41.1% of the Hungarian ones, 41.9% of the Czech, 40.7% Latvian, 55.5% Slovenian, 66.9% Estonian, 38.1% Romanian, 60.4% Slovak, 55.4% Lithuanian and 39.0% of the Bulgarian scientists. The private sector being weak still in most CEE countries has not yet made it the essential consumer of scientific research. But up to about one third of all surveyed in each of the countries think that the demand is there for scientific product by the private sector. Gradually the non-profit making organizations turn into an integral segment of science on the one hand, and on the other - into a major consumer of its results. Over 20% of CEE scientists consider the non-government organizations seekers of scientific product. Most obvious is the trend in Poland - maybe due to the fast and visible development of the sector there.

One of the most unexpected and essential results from the study of the potential migration of scientists from Central and Eastern Europe is the fact that according to the prevailing part of them foreign institutions look more for scientific product - much more than even the biggest domestic consumer - the state. This holds true for Romania, Hungary, Slovakia and Bulgaria. It can be assumed that among other factors this particular one plays immense a part for the high potential migration of scientists from these countries, mainly by means of both short-term and long-term forms of scientific exchange. The study confirmed the hypothesis that the countries more demanding of scientific results create lower potential migration among their scientists.

The scientific areas with clear vision and strategies for the future are an immensely stabilizing factor: that is why the development of appropriate strategies for each

<sup>6</sup> 'Emigration and Mobility of Bulgarian Scientists in the early 90-ies', research carried out from 1991 to 1993 by the Institute of Social Science under the guidance of Iv. ChaJakov.

scientific area would only contribute to the science keeping its highly qualified specialists to itself.

- *External Factors*

Among the external factors essential is the role of the immigration conditions and scientific policies in the developed countries, their labour legislations in respect to foreign citizens and the highly qualified ones in particular, the active assistance and effectuating of scientific exchange. As G.Stoychev states migration is explicable in terms of the information phenomenon. 'It is not the existential, but the information life abroad that is motivating for emigration.'

Among external factors the following were studied:

- \* employment opportunities in the receiving country;
- \* knowledge of labour conditions in the receiving country;
- \* geographical closeness of receiving country;
- \* living standard of receiving country;
- \* information about the country beforehand;
- \* contract arranged in advance with the receiving country;
- \* possibility of migrant's being with his/her family;
- \* possibility of children's stay and future ensured;
- \* scientific labour conditions in the receiving country;
- \* ensured transportation funding.

Of interest can presumably be the factors pointed out by the respondents which could discourage them from leaving the country for longer than one year. These factors' weight does not vary considerably across countries. In other words we can speak of factors common to all Eastern-European countries preventing them from migration abroad. As answers go the most migration holding back in Bulgaria and everywhere else alike is the parting with the family - as reported by 64.2% of respondents. Scientists are not seriously concerned about missing opportunities in Bulgaria in the years to come if they migrate abroad for longer than one year. There is no evidence of this kind of fear being connected with the attitude to emigration.

Homesickness would be preventing from emigration for 19.3% of the Polish scientists, a scarce 7.2% of the Hungarian, 12.2% of the Czech, 11.8% of the Latvian, 17.4% of Slovenian, 20.6% of Estonian, 33.3% of Romanian, 21.2% of Slovak, 31.7% of Lithuanian, 26.3% of Bulgarian scientists. There is clear evidence that the more

intensive scientific contacts and exchange a CEE country has with the developed countries, the smaller the impact of nostalgic factors on the migrational attitudes

Most devoted to their homes are the scientists from Romania and least so - those from Hungary. The scientists from Bulgaria and Romania are in the greatest degree sensitive to the receiving country's hostility to immigrants. This is easily explicable in terms of these countries being on the Shengen list, which itself is a clear display of attitude on the part of immigration authorities to migrants from these countries. That is why the scientists, who are among the affected by the restrictive Shengen regime, take more seriously the hostility to immigrants as a factor refraining them from migration. This finding has been even more explicitly confirmed by the fact that Romanian and Bulgarian scientists more than any other nationalities are conscious about administrative obstacles on the part of immigrational authorities of receiving countries.

The open and full of active social contacts way of life the Bulgarian leads and the scientist, too, puts him/her in substantially different position as against the scientists from the other countries. While loneliness in the receiving country would prevent only 4.1% of the Hungarian and 6.1% of the Czech scientists from emigration - with the Bulgarian this share is highest of all 22%.

A rough comparison with previous research suggests that the scientists' share of nostalgically conscious in their migrational behaviour is smaller than that with the overall population. Obviously the philosophy of the scientist as part of a larger world without national limitations explicates itself, although gradually so.

Scientists are in no doubts about their professional success in the receiving country. For only 9.9% of them the doubts that they might not meet the requirements of the receiving scientific organization would stop them from leaving the country for a year or more.

No significant variation can be observed in the distributions of the factors impact on the refraining from migration intentions.

### *3.5. Evaluation of The Potential Migration*

A lot of studies try to evaluate what is the share of scientists with intentions to emigrate, that is to leave the country for longer than one year. The real migration

evidence correlate with previous research results and the approximate share of scientists having left is 11.1% of the total number of those who quit jobs in science.

Potential migration has been assessed as based on different concepts and definitions, different samples and indicators. For instance according to the poll 'Bulgarian scientists and the changes in science' 19% have been estimated as willing to leave the country for longer than a year if faced with the opportunity.

The present research employed a more detailed frame of definition of potential migration as long as further polls show that the group of those intending to leave the country is not homogeneous. Some have definitely made up their mind and they are determined to emigrate. With others the attitude towards migration is a vague possibility, which can be turned into reality only under certain, quite unlikely conditions. In other words this kind of migrants are closer to non-migrants.

The potential migration was estimated under this research as based on the answers of questions B1, B2, B3, B4, and B5. The first four were integrated into a new variable consisting of all the options put together /1 - 'Will accept without any hesitation', 2 and 3 - hesitating, and 4 - 'Will reject offer'. They were crossed with the options 1 - 'Arranging trip at the moment', 2 and 3 - hesitating and 4 - 'Do not intend to leave the country' from question B5. Thus the three groups of scientists were constituted along these lines:

The grouping demonstrated that 5.8% of the scientists belong in the group of the '*determined migrants*'. These are in the process of arranging their trip and would definitely leave the country by accepting without hesitation any favourable offer ensuring a trip abroad for longer than one year. Data show that the demographic and professional characteristics of the potential migrants belonging here are closest to those of real migrants. /See previous chapter/.

'*Hesitating potential migrants*' are those who would accept an offer for longer than a year trip abroad, but under certain circumstances and not right away and at the moment. They have not undertaken any emigration steps, but the occurrence of an interesting proposal on the one hand, and on the other the meeting of certain conditions, would put them into the group of determined migrants. This group's share comes most numerous - 67.4%, as expected.

'*Firm non-migrants*' reject the possibility of ever leaving the country for longer than a year no matter how attractive an offer they might have to consider. Most strikingly their share is very high - much higher than the share of the potential



determined non-migrants among total population, as pointed out by other research. Their share is 26.8% of the sample.

On the whole the survey did not provide enough evidence of expected mass migration of scientists from Bulgaria. At the same time, however, as was proved about the real migration of scientists it is expected representatives of the most highly qualified and professional group of scientists to leave the country for longer than one year, which itself should pose a problem. Besides as the study has shown potential migrants would very easily make emigration decisions. The 'preventive' part played by the refraining factors to do with the family could very easily be neutralized or turned into motivating for emigration if the material condition of scientists unsatisfactory as it is deteriorates even further.

### ***Material Status of Potential Migrants***

The financial condition of scientists is an important factor shaping migrational attitudes. Data show that the firm emigrants have the smallest living space in comparison with the hesitating and the certain non-migrants. While the potential determined migrants most often have 10 sq.meters per person in their households, the hesitating more often than not fall into the group of those having 16 to 20 sq.meters, and the certain non-migrants - belong in the group having 21 to 30 sq.meters.

Only 9.5% of the determined migrants own a country house, while with the determined non-migrants this share is 39.6%, and with the hesitants - 26.7%.

Only 54.5% of the determined migrants have automobiles, while with the potential hesitating this share is 80%, and with the determined non-migrants - 64.9%. The same trend is obvious with the colour TV and video-cassette recorder ownership. As regards own computers though the determined migrants' group stands clearly out among the remaining groups - 42% have their own computers at home.

Quite surprisingly despite of the seemingly unfavourable financial condition of the determined migrants, a considerable share among them - 46.7% have a foreign currency bank account, while with the potential migrants this share is 26.7% and with the determined non-migrants - 30.2%. The having of such an account is a criterion not so much of the financial condition of the scientists as proof of contacts abroad and trips to need currency transfers.

Determined migrants estimate their material condition as more difficult as compared with the other migrant groups. Those pointing that they have a lot of debts are 9.2%, while this share is 3.4% with the determined non-migrants and 0% among the hesitating. Those who save up are 32.2% of the determined non-migrants, 26.7% with the hesitating and a scarce 4.5% with the determined migrants.

The place the determined migrants consider they are occupying in the social hierarchy is much lower than the self-assessment of the hesitating and the determined non-migrants. 9.1% of them consider themselves 'at the bottom', while this share with the hesitating is 0% and with the determined non-migrants - 5.1%. At the same time 69.5% of the determined migrants define themselves as average, or above, while with the determined migrants this share is 45.5%.

With the determined non-migrants the general satisfaction with their social and professional position, in combination with age and missing suitable scientific contacts all contribute to the maintaining of non-migrational behaviour, while with the determined migrants it is exactly the dissatisfaction with their position in science and society, the reluctance to work 'overtime' to ensure adequate living standard together with the commitment to professional work that are the basis of their decision for emigration. Their wages is the only source of income for 13.6% of the determined migrant group, while this share is 6.9% among the non-migrants and 6.7% among the hesitating.

The determined migrants are the most optimistic as regards their future financial condition if compared with the other potential migrant groups. This is most probably connected with their expectations for the effects from their settling abroad. Interestingly enough the determined non-migrants least of everybody expect any improvement of their financial condition which most probably is-attributable to their age and possible retirement from active professional career, or with the younger - to the estimated difficulty in preserving the achieved living and professional standards.

### ***Demographic Characteristics***

Among the hesitating migrants greatest is the share of the singles - 40%, while with the determined migrants this share is 72.7% and with the determined non-migrants - 83%. The prevailing number of determined migrants have kids /36.4%/ with age of 40% of them under 18. Ostensibly so the marital status and the hardships associated with the settling family and children abroad from a migration preventive factor have turned into a migration motivating one with the scientists, who have decided to leave

the country for longer than a year. When acute material hardships exist - as in the case of the determined migrants - family is a factor for and not against migration

The study did not provide any proof to the assumption that sex is a substantial factor for the potential migration of scientists. In all the three migrational groups the male - female shares are equal as different from the real, or accomplished migration where men are more numerous /as was stated in the previous section/.

### *Professional Characteristics and Mobility*

It would not have been grounded to assert that potential migration of scientists is solely conditioned by motives to do with their material status. Essential as these factors can be, our research has supplied evidence to the effects of the dissatisfaction with the role and place of scientist, the career opportunities, which remain important factors in the making of emigration decisions among scientists. Apart from that it has been ascertained that the determined migrants qualify very high professionally, which might only mean that the migration of these scientists could not be but estimated as actual loss suffered by science and entire society.

32% of the determined migrants have good command of English, while with the hesitating this share is 17% and with the non-migrants - 9%. The knowledge of a foreign language is an important prerequisite allowing scientists to use foreign literature and communicate with foreign countries. That is why it is only plausible that those having already made their decision are better in their knowledge of languages than the rest of scientists.

The potential firm migrants are not apprentices in science. These usually are established scientists who have their experience and achievements. 40.9% of them have been in science for more than 15 years. Youngest of them all are the hesitating migrants among which those with less than 5 years of experience are some 30%. The determined non-migrants are scientists older and more experienced - 66% of them have served for over 15 years.

A meaningful criterion of scientist's efficiency and ability is the number of scientific publications. 47.4% of the potential determined migrants have more than 10 publications. Among the non-migrants this share is a scarce 15.2%, and among the potential hesitating - 8.3%. All of the potential firmly determined migrants have published at least once abroad. This is a criterion for at least some international recognition of these scientists and their professional qualifications.

The prevailing part of the potential determined migrants - 63.6% are Ph.D. holders, and 36.4% are not. With the potential hesitant migrants the non-Ph.D. holders are more - 46.7%. With the firm non-migrants the share is considerable of those holding degrees higher than Ph.D.

Not a single one of the potential certain migrants is from the social sciences: 63.6% are from natural sciences and 36.4% from technical sciences. Most of the determined non-migrants are in technical and social sciences. The major flow of potential determined migrants comes from the BAS institutes and the government research institutes. With universities the potential migration is surprisingly low. That is probably attributable to the stability of this kind of institutions, the visibly better material condition of universities and the considerable freedom secured by this status. It is all there to prove once again that the basic factor to limit long-term migration of scientists is the stability and science financing.

Strikingly so and as different from the other groups of migrants those, who have already made up their minds do not work overtime taking occasional jobs. They are devoted to their own work and the particular research they are doing. Here lie some of the reasons for their poorer financial condition, as those who do extra work have higher incomes. As an exception to this comes the additional work on preparation of scientific publications - 22.7% of the determined migrants earn incomes from publications.

Determined migrants more often than the hesitating and the determined non-migrants participate in various forms of scientific exchange.

Some problems in the internal organization of scientific activities have seriously urged determined migrants to make their decision. The more important among them go like this:

- determined migrants state more often than the rest of scientist groups that they had not been given the opportunity to choose on the teams they have to work in on certain scientific topics;
- scientists having decided to emigrate more often point out that management is not concerned with institute's problems - that is they are more critical to institute management and administration;

- a scarce 4.8% of the determined migrants consider they have at their disposal all the scientific information they need, while with the determined non-migrants this share amounts up to 20.4%. The group of hesitant migrants is also explicitly discontent with the degree of scientific information available.
- Career progress is most important for the determined migrants group if compared with the rest of groups. 31.8% of them take that as important, while with the hesitating potential migrants this share is 20.9%, and with the determined non-migrants it is 29%. Professional contentment matters more for the determined migrants than for the hesitating and the non-migrants.
- Financial prosperity is very important for 50% of the determined migrants, for 46,7% of the hesitating and for only 27.3% of the non-migrants. The modern way of life is among the basic values of the scientists, who have made up their minds to emigrate, as different from non-migrants and hesitants. Being independent in their work, opportunities for publishing, as well as the access to topical information are more important to determined emigrants than to non-migrants.
- Of significant importance also is the reduced demand of scientific product. Only 25% of scientists believe their scientific product is in demand on the part of the state, 25% - of the private sector, and under 5% - of other sources. At the same time 65% are convinced scientific product is wanted by foreign scientific institutes mainly. These facts constitute one of the explanations of the high potential migration of scientists.

95.5% of the determined emigrants associate their expectations for professional accomplishment with leaving the country, while the same share among the hesitating is 64.3% and among the nonmigrants - a scarce 9.1%. The same clear-cut distinctions stand out in the attaining of the rest of the values - financial prosperity, independent work, and prestige in society. Reversely so, non-migrants believe they belong in Bulgaria and everything they need can be attained within the country.

The huge contrast is striking in the value' orientations and motivations of the three migration groups, as well as the diametrically opposing evaluations they make of the situation in the country and in science. Furthermore it suggests itself that the determined migrants have quite an idealized idea as to what is their anticipated realization in the receiving country is going to be. The indexes for their expected accomplishment in the respective country go as far up as 90%.

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## ***Major Destinations of Potential Migration***

Anticipated emigration is usually limited in duration.

DURATION OF POTENTIAL MIGRATION BY MIGRANT GROUPS

	1 to 3 years	4 ot5 years	6 to10 years	More than 10 years	Forever
Determined migrants	42.1	26.9	12.4	6.9	<b>11.7</b>
Hesitating	72.4	16.8	3.3	2.3	5.1

Even among the determined emigrants most numerous are those planning to stay in the receiving country for up to 3 years, and the settlers are as few as 11%. Only 27% of the potential hesitating migrants claim they would leave the country for longer than 3 years. This comes to suggest that the brain-drain is rather connected with temporary scientist movement - a response to the country's adverse condition and the hence restricted opportunities for professional realization for the moment in the country, than with firm decision to leave the country forever. This positive point of view to the relatively high potential migration as expected re-integration of migrants coming back to the country would only be fortunately advantageous for country's development.

The research showed considerable difference of direction of migrational movements between determined and hesitating migrants. Whereas 24.5% of the determined potential migrants intend to emigrate to USA and 14.3% - to Germany; with the potential 20% are bound for Germany and 22.9% - to USA. Withe the determined migrants England comes third in their preference /13.6% of the sample/, and France - fourth /10.2%/. With potential emigrants these two countries present similar patterns.

Still immensely attractive remains Canada as scientist migration destination, which is explicable in terms of the mass emigration movements of highly educated young Bulgarians there. Receiving countries are visibly ones with considerable economic potential and opportunities before science development. Along these lines it can be asserted that countries attract migrants not so much with the living standards they offer /other countries could offer that, but they do not go chosen as destinations/, but rather as scientific development places - that is scientist migration is definitely to be

associated with brain-drain processes. Another proof to that effect is the evidence as to the work the determined potential emigrants would do. 49.3% would work in a research institute on a contract, 3.4% would be taking long-term post-graduate studies, 11.0% would work jointly on a research project, 28.1% have not secured any job, but do intend to work in their major field of qualification, only 2.1% would have a contract, but not with a research institute, and whatever job, including not demanding their main qualifications, would do only 4.1% of the determined migrants. Surprising come the data concerning jobs anticipated to be taken up by hesitating potential migrants abroad: Only 5.6% are prepared to do any kind of job, and 4.7% would take a job outside science. These data, although reflecting intentions only, are demonstrative of the fact that in contrast with the remaining population scientists' basic emigration intentions have little to do without their own professional field; in other words mass emigration of scientists cannot be expected ungrounded by opportunities for settling within science or units to do with it. That is scientist migration is highly dependent on the opportunities offered by the receiving countries.

Major preconditions for migration go ranged along identical lines by the potential and the determined migrants:

- first most important precondition for migration abroad comes the better working conditions in the receiving country;
- second most important come circumstances to do with the settling and perspectives for development of kids and the settling of the family as a whole. Obviously family plays a very important motivating part both for migration and non-migration alike;
- the detailed information about the place of emigration is considered third in importance precondition;
- contract having been settled with the receiving country is considered a factor of 1/2 importance for half of each of the two potential migrant groups;
- the having of relatives in the receiving country, as well as the possibility of keeping their job here are considered factors in favour of migration.

In evaluating the factors preventing scientists to leave the country the three groups show considerable diversity. Determined migrants take impediments as generally inessential, as long as they have already made up their minds managing to overcome some of those 'disconcerting' factors. Reversely so with the firm non-migrants

obstacles are evaluated very highly. For instance 69.7% of them think the parting with their families as the basic preventive reason for their emigration, 44.7% point at homesickness, 37.5% - loneliness, 31.5% - health problems, 27.7% the opportunities they have in Bulgaria now, 27.5% - the hostility of the receiving country. That is the structure of preventing preconditions focuses mainly around social and personality factors with the personality ones slightly overtaking the social ones /basically to do with the receiving country characteristics and the situation in Bulgaria/. Major is the part played by the factors to do with the family.

The role of the receiving country is extremely important in the financing of migration movement. Only 4.6% of the determined migrants have their stay funded by their present institute, 12.2% - by other organization in the country /foundation, fund, etc./, and in 89.9% of the cases by the receiving institute. This comes demonstrative of the fact that long-term migration is a process in its main part depending on the good will and the financing of the receiving countries. The three migrant groups expect indifference on the part of their employer in the event of eventual scientist migration. Within science itself and among those in charge in particular there is no clear standing and attitude to scientists migration. After the hostility former socialist countries encountered migration with earlier - as national apostasy and treason, and in the scientific circles - as national betrayal and espionage; now the attitude to scientist emigration is merely one of indifference. It will obviously take time this process and the people emigrating to be adequately assessed in social terms.

### *3.6. Migration Attitudes of Students and Unemployed Scientists*

Research showed as early as in 1991 that the young people with higher education have stronger attitudes to emigration than those having secondary, or below secondary education.<sup>7</sup>

Considerable numbers of students make attempts to continue their education abroad and few of them return. According to a research carried out by the Student Personality Development Laboratory at the University of Sofia 'St. Kl. Ochridsky'<sup>1</sup> a third or so of the graduating students intend to leave the country for more than a year.

<sup>7</sup> 'Potential Youth Migration '91', Sofia, April 1992. Poll carried out by the National Institute of Youth in December /4 - 8-th/ 1991. 783 respondents aged between 18 and 33 living in towns of over 30,000 population.



Two focus-groups were conducted with students from the University of Sofia and from the Technical University <sup>8</sup> and most intriguing aspects were revealed of the migrational behaviours of this group, more active by definition.

Of all the students, who participated in the focus groups, one only student of mathematics declared clear intentions to remain in Bulgaria and take up a scientific career. Most of the students had more or less orientated themselves to certain countries for migration. This is demonstrative of how serious is the continuity problem in the science in Bulgaria and the possibility of attracting young and qualified specialists there.

With the students material factors - financial condition, opportunity for earning enough income to provide for the big comforts like place to live and car to drive and others come very strong. And among the motives for seeking opportunities abroad the one that weighed most was the attractiveness of the higher living standard in the receiving country. The opinion dominated that 'One can be useful only where one can be useful to oneself.'

The discussion detected sharply critical attitudes to the situation in the country, and in the educational establishment in particular - in terms of quality of training, access to suitable literature, contacts with foreign countries. Our universities obviously suffer from missing enough intensive international relations, and such including students.

The lack of information about specializations abroad and various forms of scientific exchange was emphasized.

Although scarce the data on the potential migrational attitudes of students are indicative of expected high migration among the young people graduating from university. This kind of migration could hardly be defined as brain-drain as in most cases in the receiving countries young emigrants do not do jobs directly related with their prospective professional qualifications. In this light this is emigration rather of the kind of loss of scientific potential, or brain-waste, than brain-drain.

<sup>8</sup> Two kinds of tools were used in the focus groups - an interview card, identifying the individual characteristics of the students and a questionnaire, which outlined the basic issues to be discussed. The more important among those were: evaluation of potential migrants, analysis of the motives for eventual migration, assessment of students' knowledge of immigration policies in the receiving country, etc.

The differences between potential and real migrants go quite substantial and can be distributed among:

- \* the younger in age are more inclined to emigration, but more rarely actually emigrate than those aged 35 to 45;

- \* the non-degree holders have higher potential migration, but with real migration the Ph.D. holders dominate;

- \* the scientists from the government institutes go highest in terms of potential migration, but seldom actually realize it;

- \* real migrant characteristics go closer to those of the determined potential than to any other.

Under the general survey standardized questionnaires were produced to interview all of the 5 degree-holder scientists registered as unemployed and having been formerly employed at scientific institutions in the Sofia area and discharged for reasons other than disciplinary, like staff reductions or institute's closing down. Strikingly enough all of the unemployed scientists claim they had registered at the labour offices to receive the unemployed welfare - and not to be found jobs. Obviously the kind of service provided at these offices is not particularly helpful in finding suitable employment for the specific segment of the labour market participants in question. Unfortunately as yet we do not have in Bulgaria specializing labour agencies offering highly qualified specialists - unlike most of the OECD countries. Not a single one of those interviewed had been offered job by the labour agency, or involved in any additional training or courses. That is - the possibilities are very limited of finding them jobs. None of the unemployed scientists had published abroad, had specialized or attended conferences and seminars abroad, stays in regular contacts with foreigners, none had taken up any further qualification during being unemployed. Only naturally then, despite of the dead-lock they are in, the unemployed scientists would still hesitate about possible employment or study abroad. Also strikingly unanimous were the unemployed scientists surveyed in estimating scientists' emigration abroad - definitely in the negative.

An unemployed scientist is a phenomenon incidental and short-lived. Most often the unemployment is on paper only - as some of those interviewed point out - apart from the welfare they rely on private business for providing their income. Empirical evidence collected is not enough to positively assert that the unemployed scientists

are less inclined to emigration than the remaining scientists. On the other hand, though, with the scientists the missing contacts with the international scientific community, publications, participation in international forums and others are among the major factors to generate and execute emigrational attitudes. Which is not the case with the surveyed unemployed, whose professional abilities and performances as pronounced remain emigration-proof. :

The lowering of unemployment rates in general terms and of scientists in particular proves in any case an important factor in overcoming the internal and external losses of scientific potential.

## CHAPTER 4

### INTERNAL MIGRATION AND BRAIN-EXCHANGE

#### 4.1. Evaluation of The Potential Internal Mobility of Scientists

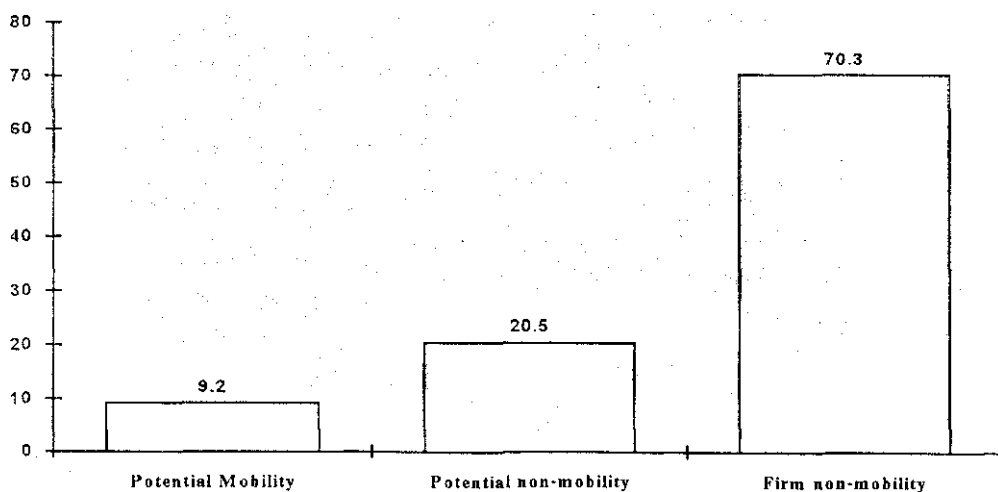
'Brain-drain' is always associated with scientists' movement abroad for a longer period of time with the purpose of performing scientific activities. What remains overlooked is the internal mobility - a process significant in its scale, and with effects under-studied and under-estimated yet. The research of the potential migration of scientists in Bulgaria incorporated some questions, whose answers were demonstrative of scientists' intentions to leave the institution they work for remaining in Bulgaria at that. Thus along lines similar to those of external migration, scientists' mobility can be anticipated from science into other spheres, possibilities of stabilizing science can be estimated, eventual effects can be outlined of upcoming internal movements of those employed in science.

Scientists intending to leave the scientific institute without leaving the country fall into two groups:

- 1/ Scientists just changing their employer remaining in science still;
- 2/ Scientists dropping out science to do things alien to the research and its possible applications, which used to be their job before. This is a process that can certainly be qualified as internal brain-waste.

Of the total of 983 interviewed the question whether they are planning to leave their present job in current year, 9.2% were determined they would leave, 20.5% were hesitating, and 70.3% asserted they would not be leaving. /The rest did not answer./

DO YOU INTEND TO CHANGE PRESENT EMPLOYER BY THE END OF THE YEAR  
/REMAINING IN BULGARIA/?



### *Potential Internal Mobility of Scientists*

General idea as to the migration attitudes of scientists from Bulgaria give the answers to the question: 'Under what circumstances would you leave science?'

Most inclined to leave their scientific jobs if offered a well-paid job abroad are Bulgarian scientists. This has been asserted by 43.0% of the sample, as different from the Hungarians, whose share is only 15.4%. This would mean that potentially most mobile are the Bulgarian scientists. It is worth noticing that for all the countries a highly paid job within the country is more attractive than such abroad. That is scientists are more prepared to leave science in their own country than abroad.

When the potential internal and external mobility of scientists data are compared with the data on the real migration in the same institutions certain important trends emerge:

- while the determined external migrant group is estimated at 5.8% of all sample, the determined internal ones are 9.2%. That is the study rejected the assumption of expected mass internal mobility and outflow from science. It can be claimed that after the mass outflow from science the point of relative stabilization has come.
- The hesitating potential internal migrants are considerably fewer than the potential external migrants which proves the still high attractiveness of 'the West'<sup>1</sup> for Bulgarian scientists and the connected with that values and likelihood of planning for the future abroad which is greater than in Bulgaria.
- If potential internal mobility data are extrapolated it can be expected 2,400 scientists to leave science in the course of the current year, which poses a problem serious in itself as long as the numbers of scientists would drop further. If scientists actually realize their firm intentions to leave the system of science, their number will further decrease in the years to follow. This might be even good for the budget of a country suffering a total financial insufficiency. However in strategic terms this potential mobility would take its toll, to the detriment of both science and society<sup>1, 1</sup>.
- External migrants are mainly from government institutes and the institutes at the Academy of science - just as the case was with the potential external and the real migration. The continuous external and internal outflow from the basic scientific institution - BAS endangers the future development of Bulgarian science.

<sup>1</sup>'Bulgarian Scientists and the Transformations in Science<sup>1</sup>, Part Two, Sofia, 1993, p. 42

**POTENTIAL INTERNAL MOBILITY OF SCIENTISTS BY TYPE OF INSTITUTION**

Place of work	Firm intentions to leave the system of science	No intentions to-leave
Academy of Sciences	7.1	92.9
University	5.3	94.7
Government Scientific Institute	18.1	81.9
Non-government Scientific Institute	16.7	83.3

With external potential migration of scientists and with their internal mobility alike the assumption was proved that the degrees of training substantially influence the mobility of scientists. Data show that least inclined to abandon scientific vocation are the highest educated among scientists - the Doctorate holders. 15.5% of 'beginner' scientists are expected to leave science in the present year which poses the problems of continuity and generation change within science. This has also been confirmed by the data about the age and years of service of the firm internal migrants. With age and years of service going up the intentions for internal mobility go down and reversely so.

**POTENTIAL INTERNAL MOBILITY OF SCIENTISTS BY SCIENTIFIC DEGREE**

		<b>PNM</b>	<b>FNM</b>	<i>Per cent</i> Total
Master of Sciences	15.5	23.4	61.1	100
Ph.D.	4.9	19.9	75.2	100
Higher than Ph.D.	1.3	10.5	88.2	100
<b>Total</b>	<b>9.2</b>		<b>70.1</b>	<b>100</b>

**POTENTIAL INTERNAL MOBILITY OF SCIENTISTS BY YEARS OF SERVICE IN SCIENCE**

	Up to 1 year	1-5 years	6-10 years	11-15 years	More than 15 years	<i>Per cent</i> Total
PM	44.4	13.3	12.0	14.6	5.5	9.2
PNM:	-	28.9	19.0	19.9	20.4	20.7
FNM	55.6	57.8	69.0	65.6	74.1	70.1
<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

**POTENTIAL INTERNAL MOBILITY OF SCIENTISTS BY AGE**

	PM	PNM	FNM	<i>Per cent</i> Total
Under 31 years	17.1	25.5	57.4	100
31-40	12.4	22.7	64.9	100
41-50	7.7	23.0	69.3	100
51-60	7.4	15.2	77.5	100
Over 60	3.1	12.5	84.4	100
<b>Total</b>	<b>9.2</b>	<b>20.7</b>	<b>70.1</b>	<b>100</b>

PM - Potential mobility; PNM - Potential non-mobility; FNM - Firm non-mobility

It is worth noticing that there is no significant male - female variation of performance as regards the potential external migration and the internal mobility.

POTENTIAL INTERNAL MOBILITY OF SCIENTISTS BY GENDER

	Male	<i>Per cent</i> Female
PM	8.6	9.9
PNM	20.0	<b>21.8</b>
FNM	71.4	68.3
<b>Total</b>		<b>100</b>

The decision to quit present job is usually to do with the poor financial condition of scientists and their willingness to find ways of improving it. 22.2% of those who had made up their minds to change jobs this year have debts, while those who live well and save up considerable part of their income account for 7.8%.

POTENTIAL INTERNAL MOBILITY OF SCIENTISTS AND PRESENT FINANCIAL CONDITION OF THEIR FAMILIES

		P NM	F NM.	<i>Per cent</i> Total
A lot of debts	22.2	22.2	55.6	100
Live on savings	16.7	11.1	72.2	100
Succeed to survive	8.6	22.8	68.6	100
Can save some money	7.8	15.6	76.6	100
Save a lot of money	8.3		91.7	100
<b>Total</b>	<b>9.2</b>	<b>20.7</b>	<b>70.1</b>	<b>100</b>

The internal mobility of scientists can be estimated in the light of the area of application of scientific knowledge and experience. Scientists who intend to leave their present job will go:

	Into science /private sector included/	Into public administration	Into private sector /not to do with science/	Other
Firm	64	5.4	16.1	14.5
Hesitant	19.2	10.9	47.4	22.5

*Note: 'Other' stands for unemployed, 'see no alternative', 'any job' and the like.*

Should internal brain-waste be anticipated? Determined and hesitating migrants go very different in that. Firm ones change their employer in 64% of the cases ensuring for themselves job in science. Hence about one third of the outflow can be claimed to represent brain-drain from science. With the hesitating migrants the eventual fluidity would not be connected with science and its applications and can be evaluated as brain-waste. It is

important not to miss out the substantial part played by the private sector /including of that to do with science/ in the mobility intentions of scientists - which comes a distinctive feature of both this sector's development and its increasing 'consumption' of scientific product; and also of the restructuring of science and its commercialization.

#### *4.2. Brain-Exchange*

The discussion of the future research on the brain-drain process began in 1991, and the research itself started in 1994. Meanwhile the process of international mobility of scientists endured some changes due to the new dynamic economic and social conditions in Bulgaria. As a result, the brain-drain process in the form of permanent leaving the country and accomplishment of scientific researches abroad, has transformed into a process of more agitated scientific exchange among the scientific institutes.

Back in 1990 scarce attempts to research the process were carried out.<sup>3</sup>

The conclusion made, is that Bulgarian participation in the process of international scientific exchange is quite insufficient. In 1990 only about 1.46% of the scientists from the Bulgarian Academy of Science (BAS) have lectured abroad. The year of 1990 set the beginning of the active scientific exchange. Every second scientist from the BAS has travelled abroad. The data show that even during the start of the process the representatives of natural sciences have participated in a higher extent in different forms of international scientific exchange.

The research on potential migration and a second one among leaders of scientific institutes give sufficient information about the forms, tendencies and future trends of this process. The findings from both researches, although different in scope and objectives, show identical results, which prove the certainty of those conclusions and recommendations.

The brain-drain process and the process of scientific exchange are closely related. The data show that the institutes with the highest scientists' emigration flow continue to produce new and qualified specialists and those same institutes are the ones highly involved in international research programs. Their members often participate in international forums and often have publications abroad.

At the same time there is a small number of institutes that have very low participation in international activities, which is a result of the achievements and the qualities of the scientific researches and not on the subject of the activity itself. In that sense the respective bodies and international organisations can be advised to work on a broader scale for the popularity of the opportunities and mechanisms for intensifying the integration of Bulgarian scientific institutes in appropriate international programs and forms of scientific co-operation. i

<sup>3</sup> Raia Staikova, Professional Activity and International Recognition of Scientists, Sociological Review, Vol. 4-5, 1993



There is a clear tendency for intensified scientific exchange if we compare the data from the study for 1991 quoted above.

The major forms of this exchange are analysed below.

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#### *4.3. Transition from Long-term to Short-term Migration (Less Than 6 Months)*

The research shows an increasing interest in the short-term forms of migration - less than 6 months. The short-term migration for specialisation, activity on a joint project, temporary short-term commitment and others, establish conditions for scientific exchange, professional performance and creating better environment for the work of the scientists. At the same time a short-term stay could always be prolonged and evolve into emigration.

The data from the research "Emigration And Mobility of Bulgarian Scientists In The Beginning Of The 90-ies" show that 28% of the scientists interviewed have been abroad during the last year.

The present research shows an intensive short-term migration of Bulgarian scientists. 34% of the interviewed intend to leave the country for less than 6 months. That is almost one-third of all the scientists, which shows high percentage of international scientific mobility. It takes different forms: short-term stipend - 16.5%, post-graduate qualification - 6.8%, Ph.D. degree - 3.6%, performing a joint research project - 21.3%, part time - 7.0%.

The work on a joint scientific project is the major mechanism for short-term mobility of scientists.

The social society and economic reforms brought about transformations in the foreign-political tendencies and destroyed the close relations in all fields of science among the countries-members of the former Union for Mutual Economic Co-operation (UMEC). Those reforms caused respective changes in science. Bulgarian scientists who traditionally graduated with high results and participated in ambitious scientific programs with the countries-members of the UMEC, mostly with the former USSR, have discontinued their traditionally intense contacts and co-operation. A good indicator for the above conclusion is that out of the 1000 scientists from all branches of science, who have been interviewed, only 5 will be travelling to an East European country for their post graduate qualification, while 338 will be travelling to a Western country. The research on real migration for 1993 showed the same tendencies, it indicated not only for a decreasing number of scientific travels, but that they are also shorter in duration.

It is important to notice that the short-term migration of scientists is usually financed by the receiving rather than the country of origin. 5.3% of the scientists are financed by the respective Bulgarian institute, 7.3% - by a different Bulgarian organisation, only 5.5% provided their own financing and 24.4% were financed by the receiving organisation.

#### PARTICIPATION IN A JOINT RESEARCH PROJECT WITH WESTERN INSTITUTES

	Share (in %) of the people participating in a joint research project
Poland	25.8
Hungary	56.1
Czech R.	43.0
Latvia	27.2
Slovenia	43.2
Estonia	37.6
Romania	17.8
Slovakia	28.4
Lithuania	22.6
<b>Bulgaria</b>	23.3

The data show that almost one-fourth of the interviewed scientists participate in a joint research project with western research institutes. In this respect Bulgarian scientists are ahead only compared with the scientists from Romania and Lithuania. Involving Bulgarian scientists and institutes in joint research projects is a problem on the level of the integration of Bulgarian with world science, and encouraging Bulgarian scientists to participate in such projects should be a major goal of the management of Bulgarian science. On the other hand that participation depends on the opportunities presented by the European integration and international organisations. In this respect it is necessary that the respective bodies should seek for additional help from different countries and determine new ways for the involvement of Bulgarian scientists in international projects. It turns out that finding the information for such opportunities is a problem. Of course, good science marketing is not enough for the participation in an international project, it also depends on the personal approach of scientists themselves. The research shows that in some countries financing a research project (an example is the presented project) is an instrument for the increase of the budget of the whole institute, and the personal support, participation and financial benefit for the scientist who has contributed for attracting the project, is quite unsatisfactory. That leads to the conclusion that participation in international projects should be managed properly and on the basis of personal interest. Specific mechanisms should be established for these needs.

One of the reasons for insufficient demand and the crisis of scientific products is the lack of local business organisations that should be willing to sponsor and support science. It is a common problem for all the countries in Central and Eastern Europe. Only 17% of the interviewed state that private firms sponsor scientific projects.

SHARE OF SCIENTISTS WORKING ON PROJECTS FINANCED FROM ABROAD

	European Union	USA
Poland	30.2	13.4
Hungary	27.6	19.2
Czech R.	39.5	15.9
Latvia	40.4	9.0
Slovenia	59.2	26.0
Estonia	22.5	6.7
Romania	40.1	6.0
Slovakia	36.9	21.4
Lithuania	62.4	12.7
Bulgaria	55,7	17.0

The prevailing part of international scientific projects, where scientists from Central and Eastern Europe, including Bulgaria, are involved, are financed by programs of the European Union. The most substantial financial support for science in general comes from the European Union. On the other hand that comes to show that Europe plays a leading role in the scientific exchange of the countries of Central and Eastern Europe. While integration in economics, legal systems and other spheres are developing slower, the process of scientific exchange is somewhat quicker.

Slovenia and Hungary receive most substantial support from American research programs. Almost 17% of the Bulgarian scientists that have been interviewed participate in scientific researches financed by American programs.

It is important to notice that approximately 21% of the scientists have stated that they participate in projects financed by foreign firms. This is a tendency that is beneficial for the development of science and its commercialisation.

Bilateral scientific co-operation is one of the most popular forms for the development and integration of science. Almost 22% of the scientists participate in programs of bilateral scientific and technical co-operation. The most substantial relations are between Bulgarian and German scientists. 5.8% of the scientists participate in joint programs, financed by Germany, 4.7% - by France, 3.0% - by England, 2.5% - by the USA, 1.3% - by other West European countries. It is evident that short-term migration is oriented towards the same destinations as the long-term migration of scientists.

In conclusion, it could be stated that Bulgarian scientific institutes in general, receive considerable international support, and mainly from Europe. Many international organisations participate in encouraging international researches, involving scientists from the countries with new democracies. Programs, financed by the USA play a substantially less important role.

If we compare the indicators of the size of scientific exchange with some of the indicators for the quality of the process and mostly the satisfaction the scientists have received in the

process, it should be stated that Bulgarian scientists are satisfied with their contacts with scientists from other countries, with the international projects, and with their participation in international scientific forums. This is yet another reason to look for new forms and mechanisms for intensifying and expanding the normally restricted participation of Bulgarian scientists in the international scientific exchange and primarily in the programs of the European Union.

Publications are an extremely important result and an indicator for the recognition of scientific work. Although only 40.8% of the scientists consider publications to be elements of great importance for their work, only 15.9% of the interviewed do not have a publication abroad. In that aspect Bulgarian scientists are leading compared to the rest of the countries from Central and Eastern Europe.

#### PUBLICATIONS ABROAD

Country	Share of the scientists without any publications abroad
Poland	41.2
Hungary	<b>21.6</b>
Czech R.	, 27.8
Latvia	43.1
Slovenia	5.0
Estonia	27.0
Romania	51.4 ;
Slovakia	29.4
Lithuania	22.7
<b>Bulgaria</b>	15.9

#### 4.4. Obstacles for the Scientific Exchange

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Many programs for mutual scientific activity exist and yet the research indicates serious problems in that respect.

- The visa requirements are a serious problem, especially for the scientists from countries with visa restrictions to the countries-members of the European Union. 53.2% of the interviewed scientists state that they have serious problems when trying to get a visa to the respective country they have to travel to. Approximately 60 % of the interviewed have missed an opportunity to travel abroad for scientific purposes because of visa problems.
- Financing of travel expenses and accommodation have been a critical obstacle for scientific exchange. Almost one-third of the interviewed scientists have stated that they face those difficulties in all their travels.
- Unfortunately approximately 14% of the scientists have to face bureaucratic difficulties from within their own institution when arranging their business travels abroad. Evidently the organisation of science and international exchange within the institutions is still a problem.

## RECOMMENDATIONS

The brain-drain process could not and cannot be terminated by means of any administrative and regulatory measures. These should basically have to do with the eliminating of the negative factors encountered by the scientists as far as possible - in terms of ensuring for them better conditions for living and work. New long-term strategy should be adopted for science with financing based on new principles so that state budget is relieved of the overall financing of science.

The government must create more opportunities for scientists to travel abroad short-term and be cooperative in intensifying the scientific exchange.

Brain-drain as typical for the early stages of the reforms can also be evaluated from the point of view of its certain positive effects for the country:

- the brain-drain process was the first step in the integration of Bulgarian science into that of the world - of its opening thus; it destroyed ideological and administrative barriers standing in the way of open communications between Bulgarian and world science. Among other things brain-drain is the response to former isolation and a demonstration of the optimistic view of science as fair and international in nature. This is the natural integration of Bulgarian science into that of the world, urged by the better material conditions facilitating scientific activities.
- The brain-drain process is open-ended. Even those who work abroad have not stated they would never come back. And the eventual return of these scientists would have immediate positive effects on our science and society. Hence the policy in respect to science should try and re-integrate migrant scientists, bring them back to their original scientific institutions, employ them under special programmes to encourage their communications with their fatherland, hire them for joint research programmes.
- Migrant scientists specialize abroad and the funding of this is provided by the receiving countries which is important in the situation of harsh budget restrictions.
- The experience migrant scientists are gaining in the receiving country comprises not only immediate research they are doing there, but also the organization of scientific activities, the market approaches in their financing and performing.
- The improving of the material condition of the scientists and their families is utterly important in the adverse circumstances of restructuring of science and limited capacity of state to ensure scientists with good income. This a way of keeping into science of specialists who would otherwise have resigned.

As one of the most eminent Bulgarian scientists in the field of micro-biology has stated, 'scientists will be leaving the country, but it would be worse of all if we deny the young people remaining here the proper conditions they need to successfully work in science.'<sup>1</sup>

A positive tool against brain-waste is the expansion of brain-exchange. It should be emphasised here that the danger of considerable internal and external migration is still there, despite the certain after crisis stabilization proved by the study. The standing danger is that an abrupt change in the material conditions and a destabilization of scientific institutions could cause the high potential migration to get transformed into mass real migration.

It is the regime of visa administration that is the major impediment of brain-exchange, hence the lifting of travel restrictions of scientists would be the major recommendation for the European Union.

On the other hand as study has shown in terms of countries' participation and distribution along the technical cooperation programmes financed by the European Union, and the bilateral programmes alike - they go concentrated mainly in the Czech republic, Hungary , Poland and Slovenia with the rest of the post-socialist countries, Bulgaria included lagging behind.

As regards bilateral cooperation Bulgarian government should address EEC countries and the countries of G-24 and demand brain-exchange and technical cooperation programmes to be further intensified.

## List of Researches and Publications on the Problems of Outbound Migration of Scientists in Bulgaria

1. "The Potential Youth Migration '91", Research, Sofia, April 1992. The research has been prepared by the National Youth Institute during the period December 4-8, 1991, 783 people between 18 and 33, who live in cities with population of more than 30 000, have been interviewed.
2. Research on the motives for applying to a university, 1994, Blagovest Georgiev and group, Laboratory for evolution of the personality of the students at the Sofia University.
3. A study on the mobility of scientists in Bulgaria. The research has been carried out in September - October 1990 in 95 scientific institutions within the system of the Bulgarian Academy of Science, and information has been given by 84 of them. It covers the period 1985-1990. Sociological Review Vol. 4-5, 1993.
4. Research "Science In A Society Aimed Towards Democracy - Strategies Of The Changes", prepared by the Sociological Institute, "Sociology of science" Section, 1991-1992.
5. Workshop on the Regional Committee of UNESCO for Europe "Brain-Drain in Europe", November 1990, Lisbon.
6. Bulgaria: Migrant profile project (Country File), January 1993, IOM.
7. Research of the Demographic Institute, Spring 1993 for the period 1990-1992 for scientists from within the system of the Bulgarian Academy of Science who are abroad. For that period 5.86% of the scientists from BAS have emigrated.
8. Sociological research, prepared in 1989 at the Sociology Institute "Potential Emigration of Bulgarian Scientists Under The Newly Relieved Passport Regime".
9. International comparative research (Albania, Bulgaria, Russia, Ukraine), 1992. "Profiles and Motives Of Potential Emigrants".
10. "Emigration And Mobility of Bulgarian Scientists In The Beginning Of The 90-ties". Research, 1991-1993, the Sociology Institute, financed by the local fund "Scientific Researches". The estimation is that 6-10% of the scientists from the 4 major scientific institutes in the country - the BAS, Sofia University, Technical University and the National and World Economy University, have emigrated.
11. "Bulgarian Scientists And The Transformation Of Science", Research, May 1993. The research is prepared among the members of the Union of Bulgarian scientists, coordinator - Petar Balkansky.